PREDICTION OF
STENOGRAPHIC SUCCESS

CALLANAN

SECTION I   MAIN THESIS

BOSTON UNIVERSITY
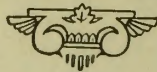
College of Business Administration

T H E S I S

PREDICTION OF STENOGRAPHIC SUCCESS

by

Grace Hanson Callanan
(B.B.A. Boston University
College of Business Administration 1927)

submitted in partial fulfilment of

the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

1 9 3 4

BOSTON UNIVERSITY
College of Business Administration

THESIS

PREDICTION OF STENOGRAPHIC SUCCESS

by
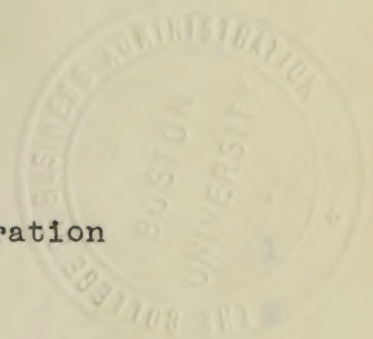
Grace Hanson Callanan
(B.B.A. Boston University
College of Business Administration 1927)

submitted in partial fulfillment of

the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

1934

INDEX

Section 1

INDEX

Section 1

INDEX

Section 2

LIST OF TABLES AND CHARTS

LIST OF TABLES AND CHARTS

Introduction

The purpose of this investigation is to find, if possible, a battery of tests which, when given to a group of students about to take up the study of stenography, will predict the probable success of the individual.

The advantage to be gained from such a prediction, if it could be relied upon, would be immense, both to the school and to the prospective student, as well as to the community.

The cost to the school of those who pursue the course, though unfitted, is great. Not only is there a great waste of time, effort, and expense, but the progress of a whole group is hampered by those who are unable to keep up with the work.

The cost to the individual who struggles against odds which he cannot overcome is greater. Even though he is able to get a passing grade in the subject, he may still be unfitted to go out and fill a position acceptably. And the mental condition which results, the helpless feeling of failure and inferiority, does him an actual harm which it is hard to estimate.

The cost to the community rises in the waste caused by those who attempt to do stenographic work though inefficient. It costs a good deal to "break in" an inexperienced girl at best, and if at the end her work is unsatisfactory, then all that expense and effort is a total loss to the employer.

Introduction

The purpose of this investigation is to find, if
possible, a battery of tests which, when given to a group of
students about to take up the study of stenography, will
predict the probable success of the individual.

The advantage to be gained from such a prediction, if
it could be relied upon, would be immense, both to the
school and to the prospective student, as well as to the
community.

The cost to the school of those who pursue the course,
though unfitted, is great. Not only is there a great waste
of time, effort, and expense, but the progress of a whole
group is hampered by those who are unable to keep up with
the work.

The cost to the individual who struggles against odds
which he cannot overcome is greater. Even though he is able
to get a passing grade in the subject, he may still be un-
fitted to go out and fill a position acceptably. And the
mental condition which results, the helpless feeling of
failure and inferiority, does him an actual harm which it
is hard to estimate.

The cost to the community lies in the waste caused
by those who attempt to do stenographic work though unfitt-
ing. It costs a good deal to "break in" an inexperienced
clerk at best, and if at the end her work is unsatisfactory,
then all that expense and effort is a total loss to the employer.

Work done by others

In general, the greater part of the investigations
along the line of prediction in stenography and typewriting
have been aimed at the stenographic or typewriting ability
of the person who is already trained. The reason for this
is given by Viteles[1] as follows:

"Inasmuch as industry does not undertake to
give training for these types of work, predic-
tion of typing and stenographic 'ability' or
'aptitude' is not a problem in vocational selec-
tion. For this reason, the author will not
consider important investigations by Lahy......
......and others, designed primarily to measure
ability to profit from training and to become
proficient in these activities."

In other words, most of the tests in use at the present time
are for the purpose of saving the business man some of the
cost of turnover occasioned by the hiring of inefficient
workers.

A very good summary of these tests up to 1927 is given
by M. Freyd[2].

M. A. Bills[3] has tried several experiments in the
selection of stenographers and other office workers. In
her Test VI she finds evidence that there is a positive
relation between mental alertness and ability in steno-

1. Viteles, M. S.--"Industrial Psychology" (1932)
   Norton, at page 311.
2. Freyd, M.--"Selection of Typists and Stenographers.
   Information on available tests." Journal of Personnel
   Research 5, (1927) pp. 490-510.
3. Bills, M. A.--"A Test for Use in the Selection of
   Stenographers" Journal of Applied Psychology, (1921)
   5, pp. 373-377.

Work done by others

In general, the greater part of the investigations along the line of prediction in stenography and typewriting have been aimed at the stenographic or typewriting ability of the person who is already trained. The reason for this is given by Viteles [1] as follows:

"Inasmuch as industry does not undertake to give training for these types of work, predic-tion of typing and stenographic 'ability' or 'aptitude' is not a problem in vocational selec-tion. For this reason, the author will not consider important investigations by Lahy......, and others, dealt primarily to measure ability to profit from training and to become proficient in these activities."

In other words, most of the tests in use at the present time are for the purpose of saving the business man some of the cost of turnover occasioned by the hiring of inefficient workers.

A very good summary of these tests up to 1927 is given by M. Fryer. [2]

M. A. Bills [3] has tried several experiments in the selection of stenographers and other office workers. In her Test VI she finds evidence that there is a positive relation between mental alertness and ability in steno-

1. Viteles, M. S.--"Industrial Psychology" (1932) Morton, at page 211.
2. Fryer, M.--"Selection of Typists and Stenographers. Information on available tests." Journal of Personnel Research, 5 (1927) pp. 490-510.
3. Bills, M. A.--"A Test for Use in the Selection of Stenographers." Journal of Applied Psychology, (1921), pp. 373-377.

graphic work. She concludes that a score of 60 in this test is the critical score and finds that the use of these tests is a great help in her work of selecting stenographers.

The article is a continuation of some previous tests[1], given by Miss Bills to the entire school, which consisted of 139 pupils. The test previously mentioned, Test VI, was a test of General Intelligence; the second test was a Special Aptitude test in stenography and typewriting, designated as Test VIII, and the third test was the Downey Will-Temperament test revised for group use. The following results were listed by her at the conclusion of these tests:

1. A battery of tests is more effective both in eliminating failures and in picking successes, than any single test.
2. Of the single tests, that of General Intelligence is the most efficient for eliminating failures.
3. Of single tests, the Special Ability test is most efficient for selecting successes.
4. Failures can be predicted by the tests with over 85% accuracy.
5. Successful stenographers can be selected.

Poffenberger[2] carried on some experiments with experienced workers and concludes that certain parts of the Alpha examination are more effective in discovering stenographic and typing ability than are some special tests designed for that purpose.

1. Bills, M. A.--"Methods for the Selection of Comptometer Operators and Stenographers" Journal of Applied Psychology. (1921), 5, pp.275-283.
2. Poffenberger, A. T.--"The Selection of a Successful Secretary" Journal of Applied Psychology (1922) 6, pp. 155-160.

graphic work. She concludes that a score of 60 in this

test is the critical score and finds that the use of these

tests is a great help in her work of selecting stenographers.

The article is a continuation of some previous tests,[1]

given by Miss Bills to the entire school, which consisted of

139 pupils. The test previously mentioned, Test VI, was a

test of General Intelligence; the second test was a Special

Aptitude test in stenography and typewriting, designated as

Test VIII, and the third test was the Downey Will-Temperament

test revised for group use. The following results were

listed by her at the conclusion of these tests:

 1. A battery of tests is more effective both in
  eliminating failures and in picking successes
  than any single test.
 2. Of the single tests, that of General Intelligence
  is the most efficient for eliminating failures.
 3. Of single tests, the Special Ability test is
  most efficient for selecting successes.
 4. Failures can be predicted by the tests with over
  85% accuracy.
 5. Successful stenographers can be selected.

Follenberger[2] carried on some experiments with ex-

perienced workers and concludes that certain parts of the

Alpha examination are more effective in discovering

stenographic and typing ability than are some special tests

designed for that purpose.

1. Bills, M. A.--"Methods for the Selection of Comptometer
 Operators and Stenographers," Journal of Applied Psychol-
 ogy, (1921), 5, pp.275-285.
2. Follenberger, A. T.--"The Selection of a Successful
 Secretary," Journal of Applied Psychology (1922) 6,
 pp.155-150.

He cites the following results by Rogers (unpublished) with two groups of skilled operators:

	Oral Descriptions	Arithmetical Problems	Practical Judgment	Synonym-Antonym	Disarranged Sentences	No. Series Completion	Analogies	Information	Total Score
	1	2	3	4	5	6	7	8	
Typewriting	.59	.78	.45	.41	.46	.60	.62	.11	.46
Stenography	.60	.77	.39	.60	.64	.55	.66	.45	.55

C. L. Hull[1] and Charles E. Limp have done some very interesting work along the line of predicting success among high school freshmen in stenography, typewriting and other subjects. They gave 40 different tests, including the Terman Group Test of Mental Ability and the Hoke Prognostic Test of Stenographic Ability which we are using in this present investigation.

The following correlations were obtained by them between these two groups of tests and the criterion.

1. Terman test complete   ≠.26
2. Information   ≠.20
3. Best Answer   ≠.08
40. Word Meaning   -.05
4. Logical selection   ≠.33
5. Arithmetic   ≠.16
6. Sentence meaning   ≠.06
7. Analogies   ≠.32
8. Mixed sentences   ≠.05
9. Classification   ≠.11
10. Number series   ≠.13

---

1. <u>Hull</u>, <u>C</u>. <u>L</u>., and <u>Limp</u>, <u>C</u>. <u>E</u>.--"The Differentiation of the Aptitudes of an Individual by Means of Test Batteries" Journal of Educational Psychology (1925), <u>16</u>, pp. 73-88.

He cites the following results by Rogers (unpublished) with two groups of skilled operators:

	Descriptions	Practical Judgement	Technical	Vocabulary	Disarranged Sentences	No. Completion of Series	Analogies	Information	Total Score
	1	2	3	4	5	6	A	B	
Typewriting	.69	.78	.45	.41	.46	.60	.62	.11	.46
Stenography	.60	.77	.59	.80	.64	.55	.68	.45	.55

C. L. Hull[1] and Charles B. Limp have done some very interesting work along the line of predicting success among high school freshmen in stenography, typewriting and other subjects. They gave 40 different tests, including the Terman Group Test of Mental Ability and the Hoke Prognostic Test of Stenographic Ability which we are using in this present investigation.

The following correlations were obtained by them between these two groups of tests and the criterion.

1.	Terman test complete	.26
2.	Information	.30
3.	Best Answer	.08
40.	Word Meaning	-.05
4.	Logical selection	.33
5.	Arithmetic	.16
6.	Sentence meaning	.06
7.	Analogies	.32
8.	Mixed sentences	.06
9.	Classification	.11
10.	Number series	.13

1. Hull, C. L., and Limp, C. E.--, "The Differentiation of the Aptitude of an Individual by Means of Test Batteries" Journal of Educational Psychology (1926), 16, pp. 73-88.

11. Hoke test complete .... $\neq$.36
12. Motor reaction .... $\neq$.05
13. Speed of writing .... $\neq$.09
14. Quality of writing .... $\neq$.15
15. Speed of reading .... $\neq$.21
16. Memory span .... $\neq$.22
17. Recognition spelling ...... $\neq$.53
18. Symbols .... $\neq$.20

They chose for a final shorthand battery Terman 2, Terman 3, Terman 6, Hoke 6, and Courtiss Multiplication--Fundamentals, and obtained on this battery a correlation of $\neq$.51 with the criterion.

In a later article[1] Limp mentions that this correlation becomes $\neq$.6116 after properly weighting the tests according to a regression equation.

Mary Lynch Gronert[2] describes a prognostic test in typewriting which she has used with good effect. The test is called the Lynch Prognostic Test and was given three times. She lists the mental traits necessary for progress in touch typewriting as ability to memorize quickly, mental alertness, and concentration.

The results seem to indicate (1) If performance and test equalled or excelled the median of the class, the pupil was almost sure to do very good work in typewriting. (2) If the performance was consistently below the median by ten or more points, he was almost sure to do failing work. (3) If he showed ability to improve in performance in suc-

1. Limp, Charles E.--"Some Scientific Approaches toward Vocational Guidance", Journal of Educational Psychology (1929), 20, pp. 530-536.
2. Gronert, Mary Lynch--"A Prognostic Test in Typewriting", Journal of Educational Psychology, (1925), 16, pp. 182-185.

-5-

11. Hoke test complete .56
12. Motor reaction .05
13. Speed of writing .09
14. Quality of writing .15
15. Speed of reading .21
16. Memory span .22
17. Recognition spelling .55
18. Symbols .20

They chose for a final shorthand battery Terman 2, Terman 3, Terman 6, Hoke 6, and Courtis Multiplication—Fundamentals, and obtained on this battery a correlation of 4.51 with the criterion.

In a later article[1] Limp mentions that this correlation becomes 4.516 after properly weighting the tests according to a regression equation.

Mary Lynch Gronert[2] describes a prognostic test in typewriting which she has used with good effect. The test is called the Lynch Prognostic Test and was given three times. She lists the mental traits necessary for progress in touch typewriting as ability to memorize quickly, mental alertness, and concentration.

The results seem to indicate (1) If performance and test equalled or excelled the median of the class, the pupil was almost sure to do very good work in typewriting. (2) If the performance was consistently below the median by ten or more points, he was almost sure to do failing work. (3) If he showed ability to improve in performance in suc-

1. Limp, Charles E.--"Some Scientific Approaches Toward Vocational Guidance," Journal of Educational Psychology (1926), 20, pp. 530-536.
2. Gronert, Mary Lynch--"A Prognostic Test in Typewriting," Journal of Educational Psychology, (1928), 16, pp. 182-186.

cessive tests and his score approached the median, he was regarded as being on the border line, and might be allowed a trial.

H. W. Rogers[1] in some very early tests approached the pupil from the angle of external factors in stenographic ability, which he describes as (a) stenography, (b) typewriting, (c) grammar, spelling, punctuation, etc.

He obtained the criterion in stenography by translating the mid-year grades of the instructor into order of merit ranks. The grammar criterion was obtained from an examination in spelling, grammar, punctuation, letter writing, paragraphing, etc. The percentage grades from this test were translated into order of merit ratings. In typewriting the usual 10-minute tests of that time with deductions of 5 words for each error were given for five successive months, the score being the net words per minute.

The tests given and the correlations with criterion were as follows:

Opposites	20.5
Verb-object	43.8
Agent-action	24.8
Action-agent	32.0
Color naming	41.0
Mixed relations	13.0
Directions	21.0
Number checking	35.0
Form subst.	28.0

---

1. Rogers, H. W.--"Psychological Tests for Stenographers and Typewriters", Journal of Applied Psychology,(1917), 1, pp. 268-274.

cessive tests and his score approached the median, he was
regarded as being on the border line, and might be allowed
a trial.

H. W. Rogers[1] In some very early tests approached the
pupil from the angle of external factors in a stenographic
ability, which he describes as (a) stenography, (b) type-
writing, (c) grammar, spelling, punctuation, etc.

He obtained the criterion in stenography by translating
the mid-year grades of the instructor into order of merit
ranks. The grammar criterion was obtained from an examina-
tion in spelling, grammar, punctuation, letter writing,
paragraphing, etc. The percentage grades from this test
were translated into order of merit ratings. In typewriting
the usual 10-minute tests of that time with deductions of
5 words for each error were given for five successive months,
the score being the net words per minute.

The tests given and the correlations with criterion
were as follows:

Opposites	20.6
Verb-object	45.8
Agent-action	24.8
Action-agent	32.0
Color naming	41.0
Mixed relations	15.0
Directions	21.0
Number checking	35.0
Form subst.	28.0

1. Rogers, H. W.—"Psychological Tests for Stenographers and
Typewriters," Journal of Applied Psychology (1917), 1,
pp. 268-274.

-5-

W. W. Tuttle[1] tried an experiment with twenty students beginning the study of typewriting. For a criterion she uses a test in typewriting. She does not memtion what the test was or how it was scored.

Following are the different tests and the correlations with criterion:

1. Motor action   ∤.54
2. Sense of rhythm   ∤.10
3. Attention & accuracy
   Part I   ∤.41
   Part II   ∤.68
4. Memory span
   Part 1   -.30
   Part 2   -.11
5. Ability to follow directions   ∤.17
6. Substitution test   ∤.52

Her total s core has a correlation of ∤.621 with the criterion.

She concludes that sense of rhythm and ability to follow directions are of but little significance in indicating ability to learn typewriting; that memory span as shown by the coefficient of correlation has no direct relation to ability to learn typewriting; but that the coefficients of correlation indicate that motor control, ability to pay attention and to be accurate, and ability to concentrate are indicative of capacity to become efficient in typewriting.

---

1. Tuttle, W. W.--"The Determination of Ability for Learning Typewriting" Journal of Educational Psychology, (1923), 14, pp. 177-181.

W. W. Tuttle[1] tried an experiment with twenty students
beginning the study of typewriting. For a criterion she
uses a test in typewriting. She does not mention what the
test was or how it was scored.

Following are the different tests and the correlations
with criterion:

1. Motor action	.54
2. Sense of rhythm	.10
3. Attention & accuracy	
Part I	.41
Part II	.88
4. Memory span	
Part I	-.30
Part 2	-.11
5. Ability to follow directions	.17
6. Substitution test	.52

Her total score has a correlation of .521 with the
criterion.

She concludes that sense of rhythm and ability to
follow directions are of but little significance in indi-
cating ability to learn typewriting; that memory span as
shown by the coefficient of correlation has no direct re-
lation to ability to learn typewriting; but that the
coefficients of correlation indicate that motor control,
ability to pay attention and to be accurate, and ability to
concentrate are indicative of capacity to become efficient
in typewriting.

1. Tuttle, W. W.--"The Determination of Ability for
Learning Typewriting," Journal of Educational Psychology,
(1923), 14, pp. 177-181.

H. C. Link[1] gives in the appendix of his book several tests which were used to predict stenographic and clerical ability. He gives the method of computing the score and claims that he has had very good success with the test, but shows no figures to indicate how great the correlation actually is. As these tests were conducted previous to 1920, some of the material would be obsolete by this time.

Method of Approach

The project was originally started in December, 1931, at which time the Terman Group Test Form B and the Hoke Test for Stenographic Ability were given to all the girls in the commercial department at that time. There was also available from the English department the results of the Tressler "Minimum Essentials of English, Form C," test.

These three particular tests were of especial interest to us because of a report from Newton at a Commercial Teachers' Convention that these tests were used there with some success, in combination with the first year typewriting marks, to predict the ability of prospective stenographic students.

The method used by this teacher was to roughly rank the pupils in groups of one to ten for each test; that is, from highest to lowest, and then to average these three marks for the purpose of obtaining a final rank. Predictions were made on the basis of this rank and the mark received in

1. <u>Link</u>, <u>H. C.</u>--"Employment Psychology" (1920) MacMillan Co.

H. C. Link[1] gives in the appendix of his book several
tests which were used to predict stenographic and clerical
ability. He gives the method of computing the score and
claims that he has had very good success with the test, but
shows no figures to indicate how great the correlation actually
is. As these tests were conducted previous to 1920, some
of the material would be obsolete by this time.

Method of Approach

The project was originally started in December, 1931,
at which time the Terman Group Test Form B and the Hoke
Test for Stenographic Ability were given to all the girls
in the commercial department at that time. There was also
available from the English department the results of the
Tressler "Minimum Essentials of English, Form C," test.
These three particular tests were of especial interest
to us because of a report from Newton at a Commercial
Teachers' Convention that these tests were used there with
some success, in combination with the first year typewriting
marks, to predict the ability of prospective stenographic
students.

The method used by this teacher was to roughly rank
the pupils in groups of one to ten for each test; that is,
from highest to lowest, and then to average these three marks
for the purpose of obtaining a final rank. Predictions were
made on the basis of this rank, and the mark received in

---

1. Link, H. C.,--"Employment Psychology" (1920)
   Macmillan Co.

-8-

first year English.

It seemed that we might get some idea as to the efficiency of these tests by this method, and then, if it seemed advisable, continue our investigation from this point. Therefore, the pupils to whom we had given the tests were ranked according to this method, and the results compared with the degree of success attained by those who had already begun the study of stenography.

We found that there was some relation between test ranks and marks obtained in shorthand and typewriting. There were, however, many discrepancies which seemed to spoil the prediction. For instance, at the end of the Senior year, four girls who failed to pass the subject had received ranks of 6, 7, 7, and 6; the next poorest student in the class had a rank of 8, and the next poorest, a rank of 2; the one girl who had received a rank of 10 finished the year with ranks of B in shorthand and A in typewriting.

Limitations and scope of project

In this thesis, I shall describe how these preliminary tests were used to obtain a battery for the prediction of success in the study of stenography at Waltham Senior High School. By success in stenography, as used here, is meant the ability to take dictation and to transcribe what is dictated accurately at a fair rate of speed with a minimum of errors in spelling, punctuation, grammar, etc.

-9-

first year English.

It seemed that we might get some idea as to the efficiency of these tests by this method, and then, if it seemed advisable, continue our investigation from this point. Therefore, the pupils to whom we had given the tests were ranked according to this method, and the re-sults compared with the degree of success attained by those who had already begun the study of stenography. We found that there was some relation between test ranks and marks obtained in shorthand and typewriting. There were, however, many discrepancies which seemed to spoil the prediction. For instance, at the end of the Senior year, four girls who failed to pass the subject had received ranks of 6, 7, 7, and 6; the next poorest student in the class had a rank of 8, and the next poorest, a rank of 8; the one girl who had received a rank of 10 finished the year with ranks of B in shorthand and A in typewriting.

Limitations and scope of project

In this thesis, I shall describe how these preliminary tests were used to obtain a battery for the prediction of success in the study of stenography at Waltham Senior High School. By success in stenography, as used here, is meant the ability to take dictation and to transcribe what is dictated accurately at a fair rate of speed with a minimum of errors in spelling, punctuation, grammar, etc.

Typewriting skill is included as a component part of stenographic ability, but is not considered in this thesis as a separate skill.

Personality is not included in our definition of success, nor are those personal qualities which are so necessary for advancement in office work. In other words, the only type of success which it is proposed to predict is the attainment of a certain skill in shorthand and typewriting and other related subjects within the period of a two-year high school course.

Subjects Participating

As before stated, the tests were given to all the girls in the commercial department of the Senior High School, which consists of the upper three grades. There were forty-nine Seniors, thirty Juniors, and forty-five Sophomores who took the test. I shall designate the groups as follows: Group A, who were Seniors, and were having their second year of shorthand, or had taken short-hand the year before; Group B, the Juniors, who had begun the study of shorthand three months previously; and Group C, Sophomores, who were beginning the study of typewriting, but had had no shorthand.

The main work on the thesis was continued two years after the original tests were given. Time enough had then elapsed so that a criterion could be established and the tests which would be useful for prediction ascertained.

Typewriting skill is included as a component part of stenographic ability, but is not considered in this thesis as a separate skill.

Personality is not included in our definition of success, nor are those personal qualities which are so necessary for advancement in office work. In other words, the only type of success which it is proposed to predict is the attainment of a certain skill in shorthand and typewriting and other related subjects within the period of a two-year high school course.

Subjects Participating

As before stated, the tests were given to all the girls in the commercial department of the Senior High School, which consists of the upper three grades. There were forty-nine Seniors, thirty Juniors, and forty-five Sophomores who took the test. I shall designate the groups as follows: Group A, who were Seniors, and were having their second year of shorthand, or had taken short-hand the year before; Group B, the Juniors, who had begun the study of shorthand three months previously; and Group C, Sophomores, who were beginning the study of typewriting, but had had no shorthand.

The main work on the thesis was continued two years after the original tests were given. Time enough had then elapsed so that a criterion could be established and the tests which would be useful for prediction ascertained.

At the end of the two years there were forty-two in Group A who had completed Senior shorthand and seven who had finished shorthand in the Junior year only. In Group B, eighteen had completed the two-year course and twelve had dropped shorthand after the first year. In Group C, the present Seniors, there were twenty-four taking shorthand, twenty-one of whom were used in the investigation. The three not used had been absent at the time the Tressler tests were given. Nine of Group C had dropped shorthand after the Junior year, and sixteen others had either left school or changed their course.

Method of Procedure

Briefly the procedure was as follows:

1. Obtaining the criterion.

2. Correlation of each unit test with the criterion.

3. Correlation of the different tests with each other.

4. Ascertaining the combined score of each two tests with each other.

5. Formulating batteries and correlating them with the criterion.

6. Comparison of batteries giving the highest correlations with criterion.

7. Comparison of ranks and positions.

8. Analysis of Group A and B records.

9. Analysis of Group C.

10. Conclusions.

At the end of the two years there were forty-two in Group A who had completed Senior shorthand and seven who had finished shorthand in the Junior year only. In Group B, eighteen had completed the two-year course and twelve had dropped shorthand after the first year. In Group C, the present Seniors, there were twenty-four taking shorthand, twenty-one of whom were used in the investigation. The three not used had been absent at the time the Tressler tests were given. Nine of Group C had dropped shorthand after the Junior year, and sixteen others had either left school or changed their course.

Method of Procedure

Briefly the procedure was as follows:

1. Obtaining the criterion.

2. Correlation of each unit test with the criterion.

3. Correlation of the different tests with each other.

4. Ascertaining the combined score of each two tests with each other.

5. Formulating batteries and correlating them with the criterion.

6. Comparison of batteries giving the highest correlations with criterion.

7. Comparison of ranks and positions.

8. Analysis of Group A and B records.

9. Analysis of Group C.

10. Conclusions.

Obtaining the Criterion

It was decided to use the members of Group C for the criterion, as they were in school and more easily available for testing purposes.

Two objectives were kept in view: First, to include as wide a variety of factors as possible; and, second, to find a criterion that would correlate as highly as possible with some existing standard of success.

The criterion is made up of three types of factors: (1) Those pertaining to typewriting speed and accuracy; (2) those pertaining to shorthand class dictation; and (3) those pertaining to a special test including difficult spelling words, matters of punctuation, etc.

(1) _Typewriting_. On Thursday, February 1, the class was given the fifteen-minute accuracy test published by the Royal Typewriting Company for December, 1928. This test had presumably been used in a previous class assignment, but not recently. The class was instructed to do its best work and was informed that the results would be used for their regular class mark and also for a special purpose.

On the following day the same test was given again with the remark that apparently they had not done their best work in accuracy the day before.

Obtaining the Criterion

It was decided to use the members of Group C for the criterion, as they were in school and more easily available for testing purposes.

Two objectives were kept in view: First, to include as wide a variety of factors as possible; and, second, to find a criterion that would correlate as highly as possible with some existing standard of success.

The criterion is made up of three types of factors: (1) Those pertaining to typewriting speed and accuracy; (2) those pertaining to shorthand class dictation; and (3) those pertaining to a special test including difficult spelling words, matters of punctuation, etc.

(1) _Typewriting._ On Thursday, February 1, the class was given the fifteen-minute accuracy test published by the Royal Typewriting Company for December, 1928. This test had presumably been used in a previous class assignment, but not recently. The class was instructed to do its best work and was informed that the results would be used for their regular class mark and also for a special purpose. On the following day the same test was given again with the remark that apparently they had not done their best work in accuracy the day before.

Table I
Results of Typewriting Tests

The net speed was ascertained by dividing total strokes by five, deducting number of errors multiplied by ten, and dividing by the number of minutes. The results of the two days are shown in Table I on page 14.

It will be noted that in the repetition of the test the next day twelve pupils did poorer work than on the previous day, and eight pupils increased their record by a small amount. By looking up the class records of the only one who showed an appreciable increase (Stebner) we found that the Thursday test was nearer her usual performance. As the results of this test seemed fair to all, we used the raw score as the first column of the content of our criterion.

The second column was obtained from the typewriting accuracy ranks as follows: The paper with the median number of errors, which happened to be nine, was arbitrarily given a mark of 65. Then the paper with the fewest errors, which was, of course, the best one, was given a score such that the difference between the two grades would be divisible by the difference in errors. The best paper, which had four errors, was given a grade of 95; thus making a difference between the two grades of 30. As the difference in errors was five, each error variation from the median would count six points in an inverse direction from the median score.

Table II on page 15 shows the number of errors in each test and the computation of the final figure for the second column in the criterion.

The net speed was ascertained by dividing total strokes
by five, deducting number of errors multiplied by ten, and
dividing by the number of minutes. The results of the two
days are shown in Table I on page 14.

It will be noted that in the repetition of the test
the next day twelve pupils did poorer work than on the
previous day, and eight pupils increased their record by a
small amount. By looking up the class records of the only
one who showed an appreciable increase (Stecher) we found
that the Thursday test was near her usual performance. As
the results of this test seemed fair to all, we used the raw
score as the first column of the content of our criterion.

The second column was obtained from the typewriting
accuracy ranks as follows: The paper with the median number
of errors, which happened to be nine, was arbitrarily given
a mark of 88. Then the paper with the fewest errors, which
was, of course, the best one, was given a score such that the
difference between the two grades would be divisible by the
difference in errors. The best paper, which had four errors,
was given a grade of 95; thus making a difference between the
two grades of 20. As the difference in errors was five, each
error variation from the median would count six points in an
inverse direction from the median score.

Table II on page 16 shows the number of errors in each
test and the computation of the final figure for the second
column in the criterion.

Table I
Results of Typewriting Tests

	Net Type. Speed Thurs.	Net Type. Speed Fri.
Adcock	44.7∕	37.7
Annunziata	41.2∕	----
Ballantine	46.0∕	44.7
Belkin	56.2∕	51.2
Cardillo	40.7-	43.0
Corson	45.2∕	40.0
Cunniffe	35.7-	28.7
DeMarco	37.3-	30.9
Gibson	39.5-	37.9
Giordano	40.1-	40.0
Greene	31.7-	33.7
Haley	36.9-	35.7
Hebert	33.3-	37.9
LaChapelle	45.3∕	47.3
Lyden	39.1-	42.0
MacDougal	46.1∕	50.6
McCauley	38.9-	28.5
McIntosh	44.5∕	42.3
Spencer	41.0-	38.0
Stebner	31.5-	39.0
Uhlin	45.3∕	49.7

$$21)\overline{875.0}$$

Mean 41.67

σ 5.9

Table I
Results of Typewriting Tests

	Net Type. Speed Thurs.	Net Type. Speed Fri.
Adcock	44.7✓	37.7
Annunziata	41.2✓	-----
Ballantine	45.0✓	44.7
Belkin	56.2✓	51.2
Cardillo	40.7-	43.0
Corson	45.2✓	40.0
Cunniffe	35.7-	35.7
DeMarco	37.2-	30.3
Gibson	38.3-	37.8
Giordano	40.1-	40.0
Greene	31.7-	35.7
Haley	36.9-	35.7
Hebert	33.3-	37.6
LaChapelle	45.3✓	47.3
Lyden	39.1-	42.0
MacDougal	46.1✓	30.6
McCauley	38.9-	38.5
McIntosh	44.5✓	42.3
Spencer	41.0-	38.0
Stebner	31.8-	39.0
Uhlin	45.3✓	40.7

21)875.0
Mean 41.67
5.9

TABLE II

Typewriting Accuracy

	No. of errors	Difference from Median	Difference from 65	Final Score
Adcock	4	-5	+30	95
Annunziata	7	-2	+12	77
Ballantine	4	-5	+30	95
Belkin	12	+3	-18	47
Cardillo	9	0	-6	59
Corson	4	-5	+30	95
Cunniffe	8	-1	+6	71
De Marco	15	+6	-36	29
Gibson	12	+3	-24	41
Giordano	7	-2	+12	77
Greene	16	+7	-42	23
Haley	9	0	0	65
Hebert	14	+5	-30	35
LaChapelle	13	+4	-24	41
Lyden	11	+2	-12	53
MacDougal	10	+1	-6	59
McCauley	12	+3	-18	47
McIntosh	8	-1	+6	71
Spencer	6	-3	+18	83
Stebner	13	+4	-24	41
Uhlin	9	0	0	65

TABLE III.

Typewriting Accuracy

No. of errors	Difference from Median	Difference from 80	Final Score
Adcock	4	-5	+30	85
Annunziata	7	-2	+12	77
Ballantine	4	-5	+30	95
Belkin	12	+5	-13	47
Cardillo	3	0	-5	80
Carson	4	-5	+30	85
Cunniffe	6	-1	+4	71
De Marco	15	+6	-26	59
Olsson	12	+5	-24	41
Giordano	7	-2	+12	77
Greene	15	+7	-42	53
Haley	6	0	0	85
Hebert	14	+5	-30	55
LaChapelle	13	+4	-24	41
Lydon	11	+2	-13	55
MacDougal	10	+1	-5	59
McCauley	12	+5	-13	47
McIntosh	6	-1	+5	71
Spencer	6	-2	+12	85
Stebner	13	+4	-24	41
Uhlin	6	0	0	85

(2) <u>Shorthand</u>.   Each month the Gregg Publishing Company
sends a printed test consisting of dictation for five minutes
which is used as a basis for making awards. The lowest rate
of speed at which these tests are given is sixty words a minute.
All members of the class were able presumably to "get" the
material at this rate.

For the computation of the third column of the criterion,
I used the average of errors of the sixty-word tests for
December, 1933, and January, 1934.

We allow ten errors for passing on these tests. The
passing mark of the Waltham Senior High School is 65%. That
would of course mean that if we were assigning a rank on a
basis of 100%, we would deduct $3\frac{1}{2}$% off for each error. In
order to make computations easier, I deducted 3% for each
error.

Table III on page 17 shows the average number of errors
in the two tests and how the score for Column 3 of the
criterion is obtained.

For the next column of the shorthand part of the
criterion I took the average of two letters dictated by
Miss W in class. These two letters were given as part of a
daily assignment toward the end of the second quarter, and
marked by her personally according to a set standard for
errors of spelling, punctuation, typewriting, form, etc.
This score will be found in Column 4 of Table VIII, Content of
Criterion, on page 25.

(3) <u>Dictation for Spelling</u>, etc. This test consisted of
the dictation of an article of about two hundred words containing

(2) **Shorthand**. Each month the Gregg Publishing Company
sends a printed test consisting of dictation for five minutes
which is used as a basis for making awards. The lowest rate
of speed at which these tests are given is sixty words a minute.
All members of the class were able presumably to "get" the
material at this rate.

For the computation of the third column of the criterion,
I used the average of errors of the sixty-word tests for
December, 1933, and January, 1934.

We allow ten errors for passing on these tests. The
passing mark of the Waltham Senior High School is 65%. That
would of course mean that if we were assigning a rank on a
basis of 100%, we would deduct 3½% off for each error. In
order to make computations easier, I deducted 3% for each
error.

Table III on page 17 shows the average number of errors
in the two tests and how the score for Column 3 of the
criterion is obtained.

For the next column of the shorthand part of the
criterion I took the average of two letters dictated by
Miss W in class. These two letters were given as part of a
daily assignment toward the end of the second quarter, and
marked by her personally according to a set standard for
errors of spelling, punctuation, typewriting, form, etc.
This score will be found in Column 4 of Table VII, Content of
Criterion, on page 56.

(3) **Dictation for Spelling, etc.** This test consisted of
the dictation of an article of about two hundred words containing

TABLE III

Average of Sixty Word Tests

	Average Errors	Deduction from 100	Score
Adcock	7	21	79
Annunziata	20	60	40
Ballantine	4	12	88
Belkin	6.5	19.5	80.5
Cardillo	11	33	67
Corson	2	6	94
Cunniffe	11.5	34.5	65.5
DeMarco	5	15	85
Gibson	21.5	64.5	35.5
Giordano	11.5	34.5	65.5
Greene	7	21	79
Haley	5	15	85
Hebert	4.5	13.5	86.5
LaChapelle	9	27	73
Lyden	2.5	7.5	92.5
MacDougal	5	15	85
McCauley	14.5	43.5	56.5
McIntosh	3.5	10.5	89.5
Spencer	3.5	10.5	89.5
Stebner	11	33	67
Uhlin	10	30	70

TABLE III

Average of Sixty Word Tests

	Average Errors	Deduction from 100	Score
Adcock	7	21	79
Annunziata	20	60	40
Ballantine	4	12	88
Belkin	6.5	19.5	80.5
Cardillo	11	33	67
Corson	2	6	94
Cunniffe	11.5	34.5	65.5
DeMarco	5	15	85
Gibson	21.5	64.5	35.5
Giordano	11.5	34.5	65.5
Greene	7	21	79
Haley	5	15	85
Hebert	4.5	13.5	86.5
LaChapelle	9	27	73
Lyden	2.5	7.5	92.5
MacDougal	5	15	85
McCauley	14.5	43.5	56.5
McIntosh	5.5	16.5	83.5
Spencer	3.5	10.5	89.5
Steher	11	33	67
Uhlin	10	30	70

difficult spelling words and several places where rules of

punctuation should be applied. A copy of this dictation

follows:

ADVICE TO A PROSPECTIVE STENOGRAPHER

There are a few things which you should know
in order to be successful and harmonious in your
business relations. I will definitely name a few
of which you should be conscious.

Obviously, courtesy and initiative, together
with ordinary technique, will be appreciated. Be
willing, however, to accept criticism without
apology.

Do not embarrass your employer with curiosity,
but anticipate his wants. Watch your pronunciation,
acquaint him with the fact that you are conscien-
tious, and be willing to accommodate him in miscel-
laneous ways. Do not make a nuisance of yourself
by forcibly criticizing his methods of work.

You must not be too slow; you must be accurate.
It is necessary, too, that you follow directions
immediately. On the other hand, do not neglect
work which is of a mechanical nature.

Be careful of the spelling of the following
words, which are difficult: separate, parallel,
rescind, recommend, occurred, receive, advisable,
believe.

I will give you one other piece of advice,
my friend. If you use your best judgment in all
you do, your employer will have little reason to
be dissatisfied with your work.

The test was dictated at a very slow rate of speed and

instructions were given that they should raise their hand

immediately if they did not hear a word. They were allowed

to erase but not to use dictionaries. They were told to

be careful of their spelling and punctuation, that primarily

accuracy would be the basis of their mark, but that time

taken in transcription would be considered.

difficult spelling words and several places where rules of

punctuation should be applied. A copy of this dictation

follows:

ADVICE TO A PROSPECTIVE STENOGRAPHER

There are a few things which you should know
in order to be successful and harmonious in your
business relations. I will definitely name a few
of which you should be conscious.

Obviously, courtesy and initiative, together
with ordinary technique, will be appreciated. Be
willing, however, to accept criticism without
apology.

Do not embarrass your employer with curiosity,
but anticipate his wants. Watch your pronunciation,
acquaint him with the fact that you are conscien-
tious, and be willing to accommodate him in miscel-
laneous ways. Do not make a nuisance of yourself
by forcibly criticising his methods of work.

You must not be too slow; you must be accurate.
It is necessary, too, that you follow directions
immediately. On the other hand, do not neglect
work which is of a mechanical nature.

Be careful of the spelling of the following
words, which are difficult: separate, parallel,
reached, recommend, occurred, receive, advisable,
believe.

I will give you one other place of advice.
my friend. If you use your best judgment in all
you do, your employer will have little reason to
be dissatisfied with your work.

The test was dictated at a very slow rate of speed and

instructions were given that they should raise their hand

immediately if they did not hear a word. They were allowed

to erase but not to use dictionaries. They were told to

be careful of their spelling and punctuation, that primarily

accuracy would be the basis of their mark, but that time

taken in transcription would be considered.

The results of this test were unsatisfactory in some ways. While intended for a spelling and punctuation test, it turned out, as a matter of fact, to be a test of ability to read notes as well.

This test was marked as follows: two off for each error in spelling; two off for each error in punctuation; two off for each word omitted (except that if it were a word that might be spelled incorrectly, three was deducted, but not more than six was taken off for a group of words omitted); for mistakes in shorthand, two if context was good, and three otherwise.

The scores secured on this test will be found in Column 5 on Table VIII, page 25.

The last column, speed of transcription, was based upon the time taken on the above dictation. The time in minutes and seconds was recorded from the time the girl started to transcribe until she turned her paper in after having looked it over carefully for errors. This was then changed to minutes and tenths of minutes. The median time was found to be 18.9 minutes and the average 18.4 minutes. The shortest length of time taken was 11.6 minutes. The difference between average and the shortest time was 6.8 minutes. I assigned the value of 65% to the average figure, 18.4, and then used 99 for the highest figure, as that would give a difference of 34 points, which would make a value of exactly two-tenths for each point. Then I added to 65% one point for each two-tenths minute less than 18.4 required to

The results of this test were unsatisfactory in some
ways. While intended for a spelling and punctuation test,
it turned out, as a matter of fact, to be a test of ability
to read notes as well.

This test was marked as follows: two off for each
error in spelling; two off for each error in punctuation;
two off for each word omitted (except that if it were a
word that might be spelled incorrectly, three was deducted.
but not more than six was taken off for a group of words
omitted); for mistakes in shorthand, two if context was
good, and three otherwise.

The scores secured on this test will be found in
Column 5 on Table VIII, page 58.

The last column, speed of transcription, was based
upon the time taken on the above dictation. The time in
minutes and seconds was recorded from the time the girl
started to transcribe until she turned her paper in after
having looked it over carefully for errors. This was then
changed to minutes and tenths of minutes. The median time
was found to be 18.0 minutes and the average 18.4 minutes.
The shortest length of time taken was 11.5 minutes. The
difference between average and the shortest time was 6.8
minutes. I assigned the value of 65% to the average figure,
18.4, and then used 99 for the highest figure, as that would
give a difference of 34 points, which would make a value of
exactly two-tenths for each point. Then I added to 65% one
point for each two-tenths minutes less than 18.4 required to

complete the test, and subtracted from 65 one point for each two-tenths more than 18.4 minutes required to complete the test.

The computation of this score is shown in detail on Table IV, page 21.

For our existing standard with which to compare the final criterion, we obtained from the teacher of Senior shorthand and typewriting, two lists in rank order: one, of the pupils according to rank at the end of the second quarter; and the second, in the order in which she estimated that they would succeed in stenographic work.

The second list was marked as follows in addition: "A" plus and "A" minus to indicate best grades of ability; "B" plus and "B" minus to indicate those who are good but will probably never rise to the highest degree of success; "C" plus for those who will probably do satisfactory work; "C" minus for those who may be able to hold a position with some employers; and "D" for those whom she considers will be absolutely failures in stenographic work.

I shall designate these two lists as "Miss W Book Ranks" and "Miss W Estimated Ranks". See Table V on page 22.

Table VI, page 23, shows the summation of the different scores used to make up the criterion, the average score, and the rank of each pupil according to the total score. Each score is used once, without weighting, as this seemed to give the best correlations with Miss W's scores.

complete the test, and subtracted from 85 one point for each
two-tenths more than 18.4 minutes required to complete the
test.

The computation of this score is shown in detail on
Table IV, page 21.

For our existing standard with which to compare the final
criterion, we obtained from the teacher of Senior shorthand
and typewriting, two lists in rank order: one, of the pupils
according to rank at the end of the second quarter; and the
second, in the order in which she estimated that they would
succeed in stenographic work.

The second list was marked as follows in addition: "A"
plus and "A" minus to indicate best grade of ability; "B" plus
and "B" minus to indicate those who are good but will probably
never rise to the highest degree of success; "C" plus for those
who will probably do satisfactory work; "C" minus for those who
may be able to hold a position with some employers; and "D" for
those whom she considers will be absolutely failures in
stenographic work.

I shall designate these two lists as "Miss W Book Ranks"
and "Miss W Estimated Ranks". See Table V on page 22.

Table VI, page 23, shows the summation of the different
scores used to make up the criterion, the average score, and
the rank of each pupil according to the total score. Each
score is used once, without weighting, as this seemed to give
the best correlations with Miss W's scores.

TABLE IV

Transcription Speed

	Time in minutes & seconds	Minutes & tenths	Deviation from mean	Relation to 65%	Score
Adcock	19.06	19.1	∤7	-3.5	61.5
Annunziata	18.00	18.0	-4	∤2	67
Ballantine	16.25	16.4	-2.0	∤10	75.0
Belkin	13.05	13.1	-5.3	∤26.5	91.5
Cardillo	16.45	16.7	-1.7	∤8.5	73.5
Corson	17.55	17.9	-.5	∤2.5	67.5
Cunniffe	20.10	20.2	∤1.8	-9	56
De Marco	19.20	19.3	∤.9	-4.5	60.5
Gibson	23.00	23.0	∤4.6	-23	42
Giordano	21.40	21.7	∤3.3	-16.5	48.5
Greene	20.08	20.1	∤1.7	-8.5	56.5
Haley	18.55	18.9	∤.5	-2.5	62.5
Hebert	21.50	21.8	∤3.4	-17	48
LaChapelle	11.35	11.6	-6.8	∤34	99
Lyden	20.35	20.6	∤2.2	-11	54
MacDougal	16.10	16.2	-2.2	∤11	76
McCauley	17.42	17.7	-.7	∤3.5	68.5
McIntosh	18.23	18.4	0	0	65
Spencer	16.30	16.5	-1.9	∤9.5	74.5
Stebner	19.30	19.5	∤1.1	-5.5	59.5
Uhlin	19.12	19.2	∤.8	-4	61

TABLE IV

Transcription Speed

	Time in minutes & seconds	Minutes & tenths	Deviation from mean	Relation Score to 65%	
Adcock	15.06	15.1	+.7	-5.5	81.5
Annunziata	16.00	16.0	-.4	+2	67
Ballantine	16.25	16.4	-2.0	+10	76.0
Balkin	15.05	15.1	-5.3	+26.5	91.5
Cardillo	16.45	16.7	-1.7	+8.5	72.5
Corson	17.55	17.9	-.5	+2.5	67.5
Cunniffe	20.10	20.2	+1.8	-9	56
De Marco	18.20	18.3	+.9	-4.5	60.5
Gibson	23.00	23.0	+4.6	-23	42
Giordano	21.40	21.7	+3.3	-16.5	48.5
Greene	20.08	20.1	+1.7	-8.5	56.5
Haley	18.35	18.6	+.6	-2.5	62.5
Hebert	21.50	21.8	+3.4	-17	48
LaChapelle	11.35	11.6	-5.8	+34	99
Lyden	20.35	20.6	+2.2	-11	54
MacDougal	16.10	16.2	-3.2	+11	76
McCauley	17.42	17.7	-.7	+3.5	68.5
McIntosh	16.23	16.4	0	0	65
Spencer	16.30	16.3	-1.9	+9.5	74.5
Stephen	19.30	19.5	+1.1	-5.5	59.5
Willis	16.13	16.2	+.6	-4	61

TABLE V

Miss W's Book Ranks	Miss W's Estimated Ranks	
1. Belkin, F.	1. Ballantine, H.	A-
2. Ballantine, H.	2. Adcock, I.	A-
3. Adcock, I.	3. Spencer, L.	B/
4. MacDougal, E.	4. Uhlin, I.	B/
5. Spencer, L.	5. MacDougal	B
6. Corson, E.	6. Belkin, F.	B-
7. Cardillo, L.	7. Corson, E.	B-
8. Haley, H.	8. McCauley, L.	C/
9. Uhlin, I.	9. De Marco, T.	C
10. De Marco, T.	10. McIntosh, R.	C
11. Lyden, M.	11. Cunniffe, A.	C
12. McCauley, L.	12. Haley, H.	C
13. McIntosh, R.	13. Lyden, M.	C
14. Cunniffe, A.	14. Gibson, E.	C
15. Greene, L.	15. Greene, L.	C
16. Hebert, J.	16. Hebert, J.	C-
17. Gibson, E.	17. LaChapelle, F.	C-
18. LaChapelle, F.	18. Cardillo, L.	C-
19. Stebner, W.	19. Stebner, W.	D
20. Giordano, L.	20. Giordano, L.	D
21. Annunziata, A.	21. Annunziata, A.	D

TABLE V

Miss W's Book Ranks	Miss W's Estimated Ranks	
1. Belkin, P.	1. Ballentine, H.	A-
2. Ballentine, H.	2. Adcock, I.	A-
3. Adcock, I.	3. Spencer, L.	B+
4. MacDougal, B.	4. Uhlin, I.	B+
5. Spencer, L.	5. MacDougal	B
6. Corson, K.	6. Belkin, P.	B-
7. Cardillo, L.	7. Corson, H.	B-
8. Haley, H.	8. McCauley, L.	C+
9. Uhlin, I.	9. De Marco, T.	C
10. De Marco, T.	10. McIntosh, R.	C
11. Lyden, M.	11. Cunniffe, A.	C
12. McCauley, L.	12. Haley, H.	C
13. McIntosh, R.	13. Lyden, M.	C
14. Cunniffe, A.	14. Gibson, H.	C
15. Greene, L.	15. Greene, L.	C
16. Hebert, J.	16. Hebert, J.	C-
17. Gibson, H.	17. LaChapelle, T.	C-
18. LaChapelle, P.	18. Cardillo, L.	C-
19. Stebner, W.	19. Stebner, W.	D
20. Giordano, L.	20. Giordano, L.	D
21. Annunziata, L.	21. Annunziata, A.	D

Table VI

Total of Criterion Figures and Averages

(Below in parentheses is shown
the rank according to totals.)

Adcock	Annunziata	Ballantine	Belkin	Cardillo	Corson
44.7	41.2	46.0	56.2	40.7	45.2
95	77	95	47	59	95
79	40	88	80.5	67	94
73	36.5	78.5	78.5	33	85.5
61	16	80	92	54	83
61.5	67	75	91.5	73.5	67.5
6)414.2(69	6)277.7(46	6)462.5(77	6)445.7(74	6)327.2(55	6)470.2(78
(6)	(20)	(2)	(3)	(16)	(1)

Cunniffe	DeMarco	Gibson	Giordano	Greene	Haley
35.7	37.3	39.5	40.1	31.7	36.9
71	29	41	77	23	65
65.5	85	35.5	65.5	79	85
61.5	86.5	73	41.5	51.5	74
79	82	60	30	79	80
56	60.5	42	48.5	56.5	62.5
6)368.7(61	6)380.3(63	6)291.0(48	6)302.6(50	6)320.7(53	6)403.4(67
(12)	(10)	(19)	(18)	(17)	(7)

Hebert	LaChapelle	Lyden	MacDougal	McCauley	McIntosh
33.3	45.3	39.1	46.1	38.9	44.5
35	41	53	59	47	71
86.5	73	92.5	85	56.5	89.5
70	60.5	61.5	72.5	68.5	58
68	59	61	76	86	69
48	99	54	76	68.5	65
6)340.8(57	6)377.8(63	6)361.1(60	6)414.6(69	6)365.4(61	6)397.0(66
(15)	(11)	(14)	(5)	(13)	(8)

Spencer	Stebner	Uhlin
41.0	31.5	45.3
83	41	65
89.5	67	70
69	0	57.5
86	46	85
74.5	59.5	61
6)443.0(74	6)245.0(41	6)383.8(64
(4)	(21)	(9)

Table VI

Total of Criterion Figures and Averages

(Below in parentheses is shown
the rank according to totals.)

Adcock	Annunziata	Ballantine	Belkin	Cardillo	Corson
44.7	41.2	46.0	56.2	40.7	45.2
95	77	95	47	59	95
79	40	88	80.5	67	94
75	56.5	78.5	76.5	55	85.5
81	16	80	58	54	83
81.5	87	76	91.5	73.5	87.5
(6)414.2(66	(6)377.7(46	(6)463.5(77	(6)445.7(74	(6)357.2(55	(6)470.2(78
(6)	(20)	(2)	(3)	(16)	(1)

Cunniffe	DeMarco	Gibson	Giordano	Greene	Haley
35.7	37.3	36.5	40.1	31.7	36.9
71	29	41	77	25	65
65.5	85	35.5	85.5	79	85
61.5	88.5	75	41.5	81.5	74
79	82	80	30	79	80
56	80.5	42	48.5	88.5	82.5
(6)368.7(61	(6)380.3(62	(6)291.0(48	(6)201.1(50	(6)330.7(55	(6)405.4(67
(12)	(10)	(19)	(18)	(17)	(7)

Hebert	LaChapelle	Lyden	MacDougal	McCauley	McIntosh
35.5	45.5	39.1	46.1	38.9	44.5
35	41	85	59	47	71
88.5	72	62.5	85	88.5	88.5
70	60.5	61.5	72.5	88.5	88
68	58	81	76	88	59
45	69	54	76	88.5	65
(6)340.3(57	(6)377.8(63	(6)411.6(69	(6)381.1(60	(6)385.8(61	(6)377.8(63
(13)	(11)	(14)	(5)	(15)	(8)

Spencer	Stebner	Uhlin
41.0	31.5	45.5
85	41	85
89.5	67	70
89	0	57.5
88	46	85
74.5	89.5	61
(6)443.8(64	(6)242.0(41	(6)443.0(74
(4)	(21)	(9)

TABLE VII

Correlation between Criterion Scores and Miss W's Ranks by Rank Differences Method

	Criterion Rank	Miss W. Book Rank	Difference	Difference ^{2}	Criterion Rank	Miss W. Estimated Rank	Difference	Difference ^{2}
Adcock	6	3	3	9	6	2	4	16
Annunziata	20	21	1	1	20	21	1	1
Ballantine	2	2	0		2	1	1	1
Belkin	3	1	2	4	3	6	3	9
Cardillo	16	7	9	81	16	18	2	4
Corson	1	6	5	25	1	7	6	36
Cunniffe	12	14	2	4	12	11	1	1
DeMarco	10	10	0		10	9	1	1
Gibson	19	17	2	4	19	14	5	25
Giordano	18	20	2	4	18	20	2	4
Greene	17	15	2	4	17	15	2	4
Haley	7	8	1	1	7	12	5	25
Hebert	15	16	1	1	15	16	1	1
LaChapelle	11	18	7	49	11	17	6	36
Lyden	14	11	3	9	14	13	1	1
MacDougal	5	4	1	1	5	5	0	
McCauley	13	12	1	1	13	8	5	25
McIntosh	8	13	5	25	8	10	2	4
Spencer	4	5	1	1	4	3	1	1
Stebner	21	19	2	4	21	19	2	4
Uhlin	9	9	0		9	4	5	25
				228				224

$$\frac{6 \times 228}{21(440)} = \; \gt .85 \qquad\qquad \frac{6 \times 224}{21(440)} = \; \gt .85$$

TABLE VII

Correlation between Criterion Scores and
Miss W's Ranks by Rank Differences Method

	Rank Criterion	Miss W. Rank	Difference	Difference		Rank Criterion	Miss W. Rank Refined	Difference	Difference
Adcock	6	5	3.	9		6	2	4	16
Annunziate	20	21	1	1		20	21	1	1
Ballantine	2	2	0			2	1	1	1
Belkin	3	1	2	4		5	6	3	9
Cardillo	16	7	9	81		18	18	2	4
Corson	1	6	5	25		1	7	6	36
Cunniffe	13	14	2	4		13	11	1	1
DeMarco	10	10	0			10	9	1	1
Gibson	19	17	2	4		19	14	5	25
Giordano	18	20	2	4		18	20	2	4
Greene	17	15	2	4		17	15	2	4
Haley	7	8	1	1		12	5	35	
Hebert	15	16	1	1		15	16	1	1
LaChapelle	11	18	7	49		11	17	6	36
Lyden	14	11	3	9		14	13	1	1
MacDougal	5	4	1	1		5	5	0	
McCauley	13	13	1	1		13	8	5	25
McIntosh	8	13	5	25		8	10	2	4
Spencer	4	3	1	1		4	3	1	1
Stebner	21	19	2	4		21	19	2	4
Uhlin	9	9	0			9	4	5	25
				448					224

$$\frac{6 \times 448}{21(440)} = 4.95 \qquad \frac{6 \times 224}{21(440)} = 4.86$$

Table VIII

CONTENT OF CRITERION

Name	Type Speed	Type Accuracy	Ave. 2 60-Word Tests	Average 2 Letters	Dictation Spell. etc.	Trans. Speed	Criterion
Adcock	44.7	95	79	73	61	61.5	69
Annunziata	41.2	77	40	36.5	16	67	46
Ballantine	46.0	95	88	78.5	80	75	77
Belkin	56.2	47	80.5	78.5	92	91.5	74
Cardillo	40.7	59	67	33	54	73.5	55
Corson	45.2	95	94	85.5	83	67.5	78
Cunniffe	35.7	71	65.5	61.5	79	56	61
DeMarco	37.3	29	85	86.5	82	60.5	63
Gibson	39.5	41	35.5	73	60	42	48
Giordano	40.1	77	65.5	41.5	30	48.5	50
Greene	31.7	23	79	51.5	79	56.5	53
Haley	36.9	65	85	74	80	62.5	67
Hebert	33.3	35	86.5	70	68	48	57
LaChapelle	45.3	41	73	60.5	59	99	63
Lyden	39.1	53	92.5	61.5	61	54	60
MacDougal	46.1	59	85	72.5	76	76	69
McCauley	38.9	47	56.5	68.5	86	68.5	61
McIntosh	44.5	71	89.5	58	69	65	66
Spencer	41.0	83	89.5	69	86	74.5	74
Stebner	31.5	41	67	0	46	59.5	41
Uhlin	45.3	65	70	57.5	85	61	64

Table VIII

CONTENT OF CHITEN'N

Name	Speed type	Vocabulary accuracy	Pages prior Ave. of s	Several averages	Modification effect.	Trans. poss.	Criterion
Adcock	44.7	95	76	73	61	61.5	69
Annunziata	41.2	77	40	36.5	16	67	46
Ballentine	46.0	88	88	78.5	30	57	77
Belkin	56.2	47	80.5	78.5	92	91.5	74
Cardillo	40.7	69	67	53	54	73.5	55
Corson	45.2	95	94	85.5	63	67.5	75
Quarrie	36.7	71	65.5	61.5	75	66	61
Delarco	37.5	39	55	56.5	82	60.5	63
Gibson	39.5	41	56.5	73	60	48	48
Giordano	40.1	77	65.5	41.5	30	48.5	50
Greene	31.7	63	79	51.5	79	56.5	53
Haley	36.9	88	85	74	80	62.5	67
Hebert	36.3	35	96.5	70	88	46	57
LaChapelle	45.3	41	73	60.5	89	60	62
Lyden	39.1	33	92.5	61.5	61	54	60
Maccoubrey	46.1	59	88	72.5	78	76	59
McGahey	36.0	47	56.5	65.5	88	59	61
Kolinksh	44.5	71	86.5	58	65	65	56
Spencer	41.0	63	80.5	89	69	74.5	74
Stelzner	31.5	41	67	0	46	59.5	41
Willin	45.3	66	70	57.5	85	61	64

The correlations according to the rank differences method between total scores and Miss W Book and Estimated Ranks are shown in Table VII, page 24, to be $+.85$ in each case. It will be noted that there are very few wide variations between criterion and either book ranks or estimated ranks. It would seem, therefore, that by comparison with these known standards, the criterion is a fair one.

Table VIII, Content of Criterion, shown on page 25, gives the score of each part of the criterion and the average of the total scores as worked out on Table VI, page 23.

Correlation of Each Test with the Criterion

Next, correlations were worked between the criterion and each unit of the original series of tests. In order to facilitate this work, Table IX, page 27, Test Results of Group C, and Table X, Deviations from Mean, Group C, shown on page 28, were drawn up.

Chart I, inserted after Table X, shows the correlations between the criterion and each of the tests which were originally given in December, 1931. This chart is divided into two parts, the first part giving for each test a series of score, deviation, and deviation squared; the second part giving a series showing the correlations between the criterion and the different tests by the Products Moments method.

-26-

The correlations according to the rank differences method
between total scores and Miss T Book and Estimated Ranks are
shown in Table VII, page 24, to be 4.85 in each case. It will
be noted that there are very few wide variations between
criterion and either book ranks or estimated ranks. It would
seem, therefore, that by comparison with these known standards,
the criterion is a fair one.

Table VIII, Content of Criterion, shown on page 25, gives
the score of each part of the criterion and the average of the
total scores as worked out on Table VII, page 23.

Correlation of Each Test with the Criterion

Next, correlations were worked between the criterion
and each unit of the original series of tests. In order
to facilitate this work, Table IX, page 27, Test Results
of Group C, and Table X, Deviations from Mean, Group C,
shown on page 28, were drawn up.

Chart I, inserted after Table X, shows the correlations
between the criterion and each of the tests which were
originally given in December, 1931. This chart is divided
into two parts, the first part giving for each test a
series of score, deviation, and deviation squared; the
second part giving a series showing the correlations
between the criterion and the different tests by the Products
Moments method.

-26-

Table IX
Test Results
GROUP C

Name	Terman 1	2	3	4	5	6	7	8	9	10	Total	Hoke 1	2	3	4	5	6	7	Total	Tr.
Adcock, I.	15	22	28	19	12	20	17	16	14	16	179	67	68	58	74	72	116	68	523	53
Annunziata, A.	12	10	0	3	4	8	7	6	11	6	67	80	78	30	30	37	72	63	390	17
Ballantine, H.	17	20	26	12	16	16	16	12	14	20	169	68	57	60	70	59	116	69	499	61
Belkin, F.	15	20	20	6	14	12	18	8	10	22	145	68	78	35	58	48	120	74	481	61
Cardilio, L.	13	16	4	10	4	14	17	10	11	14	113	71	72	30	52	38	120	62	445	47
Corson, E.	15	18	24	16	6	22	18	10	15	12	156	77	56	75	56	67	108	68	507	53
Cunniffe, A.	17	18	24	16	16	18	20	14	15	18	176	66	57	70	64	75	120	65	517	65
DeMarco, T.	15	20	18	10	18	12	15	0	13	20	141	66	62	30	42	58	120	50	428	53
Gibson, E.	12	22	20	14	6	6	16	8	14	14	132	69	66	40	30	48	62	51	366	39
Giordano, L.	11	16	4	8	18	6	8	10	12	20	113	66	70	58	36	58	100	83	471	25
Greene, L.	16	22	20	19	14	18	18	10	14	18	169	68	62	63	56	60	106	66	481	61
Haley, H.	10	20	4	11	12	0	16	8	15	18	114	70	56	50	52	80	80	53	441	64
Hebert, J.	16	22	26	15	14	14	14	8	13	14	156	64	75	50	44	52	62	0	347	45
LaChapelle, F.	12	20	28	14	8	10	16	6	12	18	144	67	74	35	62	53	116	78	485	42
Lyden, M.	13	22	20	11	12	10	15	6	11	20	140	76	57	40	52	38	82	63	408	37
MacDougal, E.	14	20	16	14	6	4	17	8	13	24	136	74	61	50	52	54	120	57	468	29
McCauley, L.	14	22	24	15	6	14	15	14	13	18	155	77	74	45	70	71	120	70	527	69
McIntosh, R.	14	20	8	11	6	2	15	16	13	18	123	65	62	30	46	50	80	58	391	46
Spencer, L.	13	20	24	18	8	14	19	18	16	22	172	50	59	45	80	70	88	49	441	56
Stebner, W.	10	16	12	13	10	0	18	0	13	28	114	48	68	50	30	46	78	64	384	38
Uhlin, I.	14	22	24	11	16	12	17	10	13	14	153	69	58	70	52	38	112	65	464	38
Totals	288	408	374	266	226	232	332	198	275	368	2967	1426	1370	1014	1108	1172	2098	1276	9464	999
Ave.	14	19	18	13	11	11	16	9	13	18	141	68	65	48	53	56	100	61	451	48

-27-

Table X

DEVIATIONS FROM MEAN
Group C

Terman   Hoke

Crit.		Terman 1	2	3	4	5	6	7	8	9	10	Hoke 1	2	3	4	5	6	7	Tr.
✓7	Adcock																		
−16	Annunziata																		
✓15	Ballantine																		
✓12	Belkin																		
−7	Cardillo																		
✓16	Corson																		
−1	Cunniffe																		
✓1	DeMarco																		
−14	Gibson																		
−12	Giordano																		
−9	Greene																		
✓5	Haley																		
✓5	Hebert																		
✓1	LaChapelle																		
✓2	Lyden																		
✓7	MacDougal																		
✓1	McCauley																		
✓4	McIntosh																		
✓12	Spencer																		
−21	Stebner																		
✓2	Uhlin																		
62	M	14	19	18	13	11	11	16	9	13	18	68	65	48	53	56	100	61	48
10.02		2.02	2.94	8.66	3.99	4.60	6.16	3.07	4.56	1.51	4.07	7.51	7.48	13.90	14.02	12.71	20.51	16.09	13.68
		.48	.38	.47	.23	.09	.40	.44	.45	.31	.27	.11	−.41	.23	.73	.43	.47	.07	.51

TERMAN 3		TERMAN 4			TERMAN 5			TERMAN 6			TERMAN 7			TERMAN 8			TERMAN 9			TERMAN 10			HOKE 1			HOKE 2			HOKE 3			HOKE 4			HOKE 5			HOKE 6			HOKE 7			TRESSLER		
Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq	Score	Deviation	Dev Sq
+10	100	19	+6	36	12	+1	1	20	+9	81	17	+1	1	16	+7	49	14	+1	1	16	-2	4	67	-1	1	68	+3	9	58	+10	100	74	+21	441	72	+16	256	116	+16	256	68	+7	49	53	+5	25
-18	324	3	-10	100	4	-7	49	8	-3	9	7	-9	81	6	-3	9	11	-2	4	6	-12	144	80	+12	144	78	+13	169	30	-18	324	30	-23	529	37	-19	361	72	-28	784	63	+2	4	17	-31	961
+8	64	12	-1	1	16	+5	25	16	+5	25	16	0		12	+3	9	20	+2	4	12	-6	36	68	0		57	-8	64	60	+12	144	70	+17	289	59	+3	9	116	+16	256	69	+8	64	61	+13	169
+2	4	6	-7	49	14	+3	9	12	+1	1	18	+2	4	8	-1	1	10	-3	9	22	+4	16	68	0		78	+13	169	35	-13	169	58	+5	25	48	-8	64	120	+20	400	74	+13	169	61	+13	169
-14	196	10	-3	9	4	-7	49	14	+3	9	17	+1	1	10	+1	1	11	-2	4	14	-4	16	71	+3	9	72	+7	49	30	-18	324	52	-1	1	38	-18	324	62	+1	1	47	-1	1	53	+5	25
+6	36	16	+3	9	6	-5	25	22	+11	121	18	+2	4	18	+2	4	10	+1	1	12	-6	36	77	+9	81	56	-9	81	75	+27	729	56	+3	9	67	+11	121	108	+8	64	68	+7	49	53	+5	25
+6	36	16	+3	9	16	+5	25	18	+7	49	20	+4	16	14	+5	25	15	+2	4	18	0		66	-2	4	57	-8	64	70	+22	484	64	+11	121	75	+19	361	65	+4	16	65	+17	289			
0		10	-3	9	18	+7	49	12	+1	1	15	-1	1	0	-9	81	13	0		20	+2	4	66	-2	4	62	-3	9	30	-18	324	42	-11	121	58	+2	4	120	+20	400	50	-11	121	53	+5	25
+2	4	14	+1	1	6	-5	25	6	-5	25	16	0		8	-1	1	14	+1	1	14	-4	16	69	+1	1	66	+1	1	40	-8	64	30	-23	529	48	-8	64	62	-38	1444	51	-10	100	39	-9	81
-14	196	8	-5	25	18	+7	49	6	-5	25	8	-8	64	10	+1	1	12	-1	1	20	+2	4	66	-2	4	70	+5	25	58	+10	100	36	-17	289	58	+2	4	100	0		83	+22	484	25	-23	529
+2	4	19	+6	36	14	+3	9	18	+7	49	18	+2	4	10	+1	1	14	+1	1	18	0		68	0		62	-3	9	63	+15	225	56	+3	9	60	+4	16	106	+6	36	61	+13	169	61	+13	169
-14	196	11	-2	4	12	+1	1	0	-11	121	16	0		8	-1	1	15	+2	4	18	0		70	+2	4	56	-9	81	50	+2	4	52	-1	1	80	+24	576	80	-20	400	53	-8	64	64	+16	256
+8	64	15	+2	4	14	+3	9	14	+3	9	14	-2	4	8	-1	1	13	0		14	-4	16	64	-4	16	75	+10	100	50	+2	4	44	-9	81	52	-4	16	62	-38	1444	45	-3	9			
+10	100	14	+1	1	8	-3	9	10	-1	1	16	0		6	-3	9	12	-1	1	18	0		67	-1	1	74	+9	81	35	-13	169	62	+9	81	53	-3	9	116	+16	256	78	+17	289	42	-6	36
+2	4	11	-2	4	12	+1	1	10	-1	1	15	-1	1	6	-3	9	11	-2	4	20	+2	4	76	+8	64	57	-8	64	40	-8	64	52	-1	1	38	-18	324	82	-18	324	63	+2	4	37	-11	121
-2	4	14	+1	1	6	-5	25	4	-7	49	17	+1	1	8	-1	1	13	0		24	+6	36	74	+6	36	61	-4	16	50	+2	4	52	-1	1	54	-2	4	120	+20	400	57	-4	16	29	-19	361
+6	36	15	+2	4	6	-5	25	14	+3	9	15	-1	1	14	+5	25	13	0		18	0		77	+9	81	74	+9	81	45	-3	9	70	+17	289	71	+15	225	120	+20	400	70	+9	81	69	+21	441
-10	100	11	-2	4	6	-5	25	2	-9	81	15	-1	1	16	+7	49	13	0		18	0		65	-3	9	62	-3	9	30	-18	324	46	-7	49	50	-6	36	80	-20	400	58	-3	9	46	-2	4
+6	36	18	+5	25	8	-3	9	14	+3	9	19	+3	9	18	+9	81	16	+3	9	22	+4	16	50	-18	324	59	-6	36	45	-3	9	80	+27	729	70	+14	196	88	-12	144	49	-12	144	56	+8	64
-6	36	13	0		10	-1	1	0	-11	121	18	+2	4	0	-9	81	13	0		22	+4	16	48	-20	400	68	+3	9	50	+2	4	30	-23	529	46	-10	100	78	-22	484	64	+3	9	38	-10	100
+6	36	11	-2	4	16	+5	25	12	+1	1	17	+1	1	10	+1	1	13	0		14	-4	16	69	+1	1	58	-7	49	70	+22	484	52	-1	1	38	-18	324	112	+12	144	65	+4	16	38	-10	100
	1576	266		335	226		445	232		797	332		198	198		437	275		48	369		348	1426		1184	1370		1175	1014		4062	1108		4125	1172		3394	2098		8836	1276		5435	999		3935
	75.05	13		15.95	11		21.1?	11		37.95	16		9.43	9		20.81	13		2.29	18		16.59	68		56.38	65		55.95	48		193.43	48		196.43	56		161.62	100		420.76	61		258.81	48		187.38
	8.66			3.99			4.60			6.16			3.07			4.56			1.51			4.07			7.51			7.48			13.90			14.03			12.71			20.51			16.09			13.68

CHART I

	CRITERION			TERMAN 1			TERMAN 2			
	Score	Deviation	Deviation Squared	Score	Deviation	Deviation Squared	Score	Deviation	Deviation Squared	Score
Adcock, I.	69	+7	49	15	+1	1	22	+3	9	28
Annunziata, A.	46	-16	256	12	-2	4	10	-9	81	0
Ballantine, H.	77	+15	225	17	+3	9	20	+1	1	26
Belkin, F.	74	+12	144	15	+1	1	20	+1	1	20
Cardillo, L.	55	-7	49	13	-1	1	16	-3	9	4
Corson, E.	78	+16	256	15	+1	1	18	-1	1	24
Cunniffe, A.	61	-1	1	17	+3	9	18	-1	1	24
DeMarco, T.	63	+1	1	15	+1	1	20	+1	1	18
Gibson, E.	48	-14	196	12	-2	4	22	+3	9	20
Giordano, L.	50	-12	144	11	-3	9	16	-3	9	4
Greene, L.	53	-9	81	16	+2	4	22	+3	9	20
Haley	67	+5	25	10	-4	16	20	+1	1	4
Hebert, J.	57	-5	25	16	+2	4	22	+3	9	26
LaChapelle, F.	63	+1	1	12	-2	4	20	+1	1	28
Lyden, M.	60	-2	4	13	-1	1	22	+3	9	20
MacDougal, E.	69	+7	49	14	0		20	+1	1	16
McCauley, L.	61	-1	1	14	0		22	+3	9	24
McIntosh, R.	66	+4	16	14	0		20	+1	1	8
Spencer, L.	74	+12	144	13	-1	1	20	+1	1	24
Stebner, W.	41	-21	441	10	-4	16	16	-3	9	12
Uhlin, I.	64	+2	4	14	0		22	+3	9	24
Total	1296		2112	288		86	408		181	374
Mean	62		100.52	14		4.09	19		8.62	18
			10.02			2.02			2.94	

Correlation of Tests with Each Other

The correlations of the tests with each other was then worked out by the Products Moments method, with the results shown on Table XI, page 31. The correlations worked out in detail are given in Appendix A of the Supplement.

Multiple Correlation

The next step seemed to be to find out the highest correlation that would be possible between any two of the tests. The formula for getting the highest correlation possible between two tests with proper weighting, is given by Otis[1] as follows:

$$RC_{12} = \frac{\sqrt{r^2C1 \neq r^2C2 - 2rC1rC2r12}}{1 - r^2_{12}}$$

The results of this are given in Table XII, Multiple Correlations of Each Two Tests, shown on page 32. See Appendix B of the Supplement for working figures.

That seemed about as far as we could go on the combination of tests, as further work would be too laborious. Next, a table was made out showing crosses against the tests that it seemed would not go well with each other because of overlapping. This was determined primarily upon examination of the Products Moments columns in the correlations of tests with each other, and with reference

---

1. Otis, Arthur S.--"Statistical Method in Educational Measurements" World Book Company (1925) page 239.

Correlation of Tests with Each Other

The correlations of the tests with each other was then worked out by the Products Moments method, with the results shown on Table XI, page 31. The correlations worked out in detail are given in Appendix A of the Supplement.

Multiple Correlation

The next step seemed to be to find out the highest correlation that would be possible between any two of the tests. The formula for getting the highest correlation possible between two tests with proper weighting, is given by Otis[1] as follows:

$$RO_{12} = \sqrt{\frac{r_{1G}^2 + r_{2G}^2 - 2r_{1G}r_{2G}r_{12}}{1 - r_{12}^2}}$$

The results of this are given in Table XII, Multiple Correlations of Each Two Tests, shown on page 32. See Appendix B of the Supplement for working figures.

That seemed about as far as we could go on the combination of tests, as further work would be too laborious. Next, a table was made out showing crosses against the tests that it seemed would not go well with each other because of overlapping. This was determined primarily upon examination of the Products Moments column in the correlations of tests with each other, and with reference

---

1. Otis, Arthur S.,--"Statistical Method in Educational Measurements." World Book Company (1925) page 236.

to Table XII.   This sheet, Table XIII, Tests Which Cor-
relate Highly With Each Other, is shown on page 33.

We considered in making this chart that even though
a test had a high correlation with another test (I assumed
that over $\pm.30$ was high), if there were as many as seven
tests in the group with unlike signs, a correlation even
as high as $\pm.40$ might not spoil the test for combination
with other tests.

As a check, I used Table XII previously mentioned.
If the correlation of the two tests together was less
than that of either of the tests with the criterion, the
two tests would probably not be good in combination with
other tests.

We will say, for instance, that there was doubt as
to whether or not Terman 1 and Terman 7 should be used
in the same battery.   The correlation of Terman 1 with
the criterion was $\pm.48$, and the correlation of Terman 7
with the criterion was $\pm.44$.   Upon referring to Table XII
it was found that the combination of the two tests to-
gether could not possibly yield a greater correlation than
$\pm.47$, which was less than that of Terman 1 alone.   It
would seem, then, that Terman 1 and Terman 7 should not
be used in the same battery.

to Table XII. This sheet, Table XIII, Tests Which Cor-

relate Highly With Each Other, is shown on page 35.

We considered in making this chart that even though

a test had a high correlation with another test (I assumed

that over .30 was high). If there were as many as seven

tests in the group with unlike sigma, a correlation even

as high as .40 might not spoil the test for combination

with other tests.

As a check, I used Table XII previously mentioned.

If the correlation of the two tests together was less

than that of either of the tests with the criterion, the

two tests would probably not be good in combination with

other tests.

We will say, for instance, that there was doubt as

to whether or not Terman I and Terman V should be used

in the same battery. The correlation of Terman I with

the criterion was .48, and the correlation of Terman V

with the criterion was .44. Upon referring to Table XII

it was found that the combination of the two tests to-

gether could not possibly yield a greater correlation than

.47, which was less than that of Terman I alone. It

would seem, then, that Terman I and Terman V should not

be used in the same battery.

Table XI

Correlations of Tests With Criterion and With Each Other

		Crit.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7
Terman	1	+.48																	
	2	+.38	+.34																
	3	+.47	+.60	+.67															
	4	+.23	+.35	+.56	+.66														
	5	+.09	+.34	+.26	+.25	-.01													
	6	+.40	+.74	+.24	+.63	+.45	+.16												
	7	+.44	+.36	+.50	+.56	+.64	+.03	+.32											
	8	+.45	+.34	+.26	+.24	+.42	-.14	+.39	+.20										
	9	+.31	+.17	+.30	+.34	+.71	+.07	+.23	+.45	+.41									
	10	+.27	+.02	+.36	+.19	+.22	+.19	+.24	-.41	-.03	+.08								
Hoke	1	+.11	-.17	-.07	-.12	-.30	-.24	+.20	-.35	-.01	-.33	-.48							
	2	-.41	-.19	-.31	-.18	-.37	-.24	-.08	-.43	-.19	-.65	-.86	+.06						
	3	+.23	+.34	+.20	+.40	+.50	+.40	+.44	+.31	+.29	+.57	-.01	-.02	-.52					
	4	+.73	+.48	+.43	+.61	+.52	-.13	+.43	+.44	+.51	+.30	+.30	-.05	-.25	+.28				
	5	+.43	+.20	+.26	+.29	+.57	+.19	+.28	+.32	+.45	+.74	+.25	-.13	-.34	+.43	+.56			
	6	+.47	+.44	+.12	+.31	+.12	+.22	+.49	+.35	+.16	-.07	+.30	+.38	-.07	+.22	+.55	+.31		
	7	+.07	-.17	-.25	-.09	-.22	+.10	+.009	-.02	-.05	-.21	+.15	+.20	-.02	+.12	+.18	+.02	+.55	
	Tr.	+.51	+.48	+.54	+.43	+.47	+.23	+.44	+.64	+.38	+.42	+.21	-.12	-.26	+.23	+.67	+.67	+.31	+.10

Table XII

Multiple Correlations of Each Two Tests

	Crit.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7
Terman 1	+.48																	
2	+.38	+.50																
3	+.47	+.59	+.64															
4	+.23	+.48	+.37	+.48														
5	+.09	+.47	+.37	+.47	+.22													
6	+.40	+.67	+.48	+.48	+.40	+.40												
7	+.44	+.47	+.46	+.51	+.44	+.45	+.52											
8	+.45	+.57	+.51	+.58	+.67	+.47	+.51	+.57										
9	+.31	+.52	+.42	+.49	+.30	+.31	+.48	+.45	+.47									
10	+.27	+.55	+.40	+.50	+.32	+.26	+.55	+.45	+.53	+.39								
HoKe 1	+.11	+.47	+.40	+.49	+.30	+.14	+.40	+.52	+.47	+.39	+.37							
2	-.41	+.57	+.49	+.57	+.42	+.40	+.55	+.50	+.56	+.41	+.44	+.42						
3	+.23	+.49	+.41	+.47	+.26	+.22	+.40	+.45	+.46	+.32	+.35	+.24	+.40					
4	+.73	+.70	+.58	+.73	+.75	+.74	+.73	+.74	+.73	+.73	+.73	+.74	+.48	+.73				
5	+.43	+.74	+.51	+.56	+.44	+.42	+.52	+.53	+.52	+.42	+.46	+.46	+.51	+.42	+.73			
6	+.47	+.55	+.56	+.57	+.50	+.47	+.51	+.55	+.60	+.57	+.48	+.47	+.60	+.48	+.73	+.56		
7	+.07	+.65	+.41	+.48	+.26	+.10	+.45	+.45	+.45	+.33	+.26	+.10	+.41	+.22	+.73	+.44	+.52	
Tr.	+.51	+.57	+.52	+.58	+.51	+.51	+.54	+.53	+.49	+.52	+.53	+.53	+.48	+.52	+.73	+.52	+.57	+.51

TABLE XIII

TESTS WHICH CORRELATE HIGHLY WITH EACH OTHER

	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	Tr
1			X	X	X	X	X							X		X		X
2			X							X								
3	X	X		X		X	X			X				X				X
4	X		X				X		X					X				
5	X												X					
6	X		X				X									X		X
7	X		X	X		X			X					X				X
8									X						X			X
9				X			X	X					X		X			X
10		X	X															
1																		
2																		
3					X				X									
4	X		X	X			X								X	X		X
5						X	X							X				X
6	X				X									X			X	X
7																X		
Tr	X		X			X	X	X	X					X	X	X		

Formulating Batteries

Now the problem was to find the tests which would combine to make the best battery for prediction. C. L. Hull in his book "Aptitude Testing"[1] gives some excellent suggestions for combining tests. At this stage of the work I followed his method as far as possible. He chose for his battery those tests which had high correlations with the criterion and low correlations with themselves.

Three tests were eliminated from serious consideration at the outset. First, the Tressler test, because it had a high correlation with nearly all tests, and also because the score of this test included a combination of several tests, and the chances seemed rather strong that the qualities shown in this test would be duplicated in other tests.

Another was Hoke 3, the test for Quality of Handwriting. It seemed that the scoring of this test was too uncertain to place too much dependence upon the results.

The third was Hoke 7, because one pupil in this test failed to make any score at all, apparently because of misunderstanding the tests. Although other tests gave a score of 0, in each case the score seemed right for that particular test. In this case, Substitution of Symbols, the pupil did not understand what was required.

In working out the correlation of this test with the criterion, omitting this pupil, the score was -.03. See Supplement, page 213, for the correlation of Criterion and Hoke 7 without this pupil.

1.Hull, C. L.--"Aptitude Testing" World Book Co., 1928

Formulating Batteries

Now the problem was to find the tests which would combine to make the best battery for prediction. C. L. Hull in his book "Aptitude Testing"[1] gives some excellent suggestions for combining tests. At this stage of the work I followed his method as far as possible. He chose for his battery those tests which had high correlations with the criterion and low correlations with themselves.

Three tests were eliminated from serious consideration at the outset. First, the Treasler test, because it had a high correlation with nearly all tests, and also because the score of this test included a combination of several tests, and the chances seemed rather strong that the qualities shown in this test would be duplicated in other tests. Another was Hoke 3, the test for Quality of Handwriting. It seemed that the scoring of this test was too uncertain to place too much dependence upon the results.

The third was Hoke 7, because one pupil in this test failed to make any score at all, apparently because of misunderstanding the tests. Although other tests gave a score of 0, in each case the score seemed right for that particular test. In this case, Substitution of Symbols, the pupil did not understand what was required.

In working out the correlation of this test with the criterion, omitting this pupil, the score was -.03?. See Supplement, p. 21?, for the correlation of Criterion and Hoke 7 without this pupil.

1.Hull, C. L.--"Aptitude Testing," World Book Co., 1928

Then I started with Terman 1 to see which tests would correlate well with that. Terman 2 seemed satisfactory. It had a correlation with the criterion of $+.38$ and with test 1 of $+.34$, but showed a score of $+.50$ when combined with Test 1 on the table of Multiple Correlation.

Terman 3 had a correlation of $+.60$ with Terman 1, and of $+.67$ with Terman 2. Therefore, it would not go well with either test.

Terman 4 had a correlation of $+.23$ with the criterion of $+.35$ with Terman 1, and of $+.56$ with Terman 2. It would seem, therefore, that this test would not be of any use.

Terman 5, with a correlation of $+.09$, would probably be of no value. On the table of combinations it would give $+.47$ with Terman 1 and $+.37$ with Terman 2. These were both lower than the original correlations.

Terman 6 had a correlation of $+.40$ with the criterion, but the correlation with Terman 1 was $+.74$.

Terman 7 with a correlation of $+.44$ with the criterion, and of $+.36$ with Terman 1 looked better, but on consulting the combination chart, we found that it would reduce the score of Terman 1 if combined with that test.

Terman 8, with a correlation of $+.45$ with criterion, and a score of $+.34$ and $+.26$ with Terman 1 and Terman 2, respectively, looked more promising. In combination with Terman 1, it would yield $+.57$; and with Terman 2 it would yield $+.51$.

Then I started with Terman I to see which tests would
correlate well with that. Terman 2 seemed satisfactory.
It had a correlation with the criterion of .38 and with
test I of .34, but showed a score of .50 when combined
with Test I on the table of Multiple Correlation.

Terman 3 had a correlation of .50 with Terman 1, and
of .57 with Terman 2. Therefore, it would not go so well
with either test.

Terman 4 had a correlation of .35 with the criterion
of .38 with Terman 1, and of .56 with Terman 2. It would
seem, therefore, that this test would not be of any use.

Terman 5, with a correlation of .09, would probably
be of no value. On the table of combinations it would
give .47 with Terman 1 and .37 with Terman 2. These
were both lower than the original correlations.

Terman 6 had a correlation of .40 with the criterion,
but the correlation with Terman 1 was .74.

Terman 7 with a correlation of .44 with the criterion,
and of .36 with Terman 1 looked better, but on consulting
the combination chart, we found that it would reduce the
score of Terman I if combined with that test.

Terman 8, with a correlation of .45 with criterion,
and a score of .34 and .36 with Terman 1 and Terman 2,
respectively, looked more promising. In combination with
Terman 1, it would yield .57; and with Terman 2 it would
yield .51.

Terman 9 had a correlation of ⊬.31 with the criterion, ⊬.17 with Terman 1, ⊬.30 with Terman 2, and ⊬.41 with Terman 8. Upon looking at the combination chart, we found that in each case the score would be improved by a combination with each Terman 1, Terman 2, and Terman 8.

Terman 10 had a correlation of ⊬.27 with the criterion, of ⊬.02 with Terman 1, of ⊬.36 with Terman 2, of -.03 with Terman 8, and of ⊬.08 with Terman 9. Although the correlation with criterion was low, that with all the other tests except Terman 2 was also low.

Hoke 1 had a correlation of ⊬.11 with the criterion, which was low, but the correlations with the other tests were extremely low; namely, ⊬.17 with Terman 1, -.07 with Terman 2, -.01 with Terman 8, -.33 with Terman 9, -.48 with Terman 10. Combined with Terman 1 it decreased the score of that test by one point, but it increased the score of Terman 2 by .02, of Terman 8 by .02, of Terman 9 by .08, and of Terman 10 by .10. It therefore looked as though Hoke 1 would be a good test to include.

Hoke 2 showed a negative correlation.

Hoke 3 was omitted for reasons given above.

Hoke 4 appeared to be the best test, with a correlation of ⊬.73 with the criterion.

Hoke 5 looked good, and Hoke 6 looked good.

The next step was to try out combinations with Terman 1, and so on until we found the best battery.

Terman 9 had a correlation of .51 with the criterion,
.17 with Terman 1, .30 with Terman 2, and .41 with
Terman 8. Upon looking at the combination chart, we found
that in each case the score would be improved by a combin-
ation with each Terman 1, Terman 2, and Terman 8.

Terman 10 had a correlation of .27 with the criterion,
of .02 with Terman 1, of .36 with Terman 2, of -.03 with
Terman 8, and of .08 with Terman 9. Although the correla-
tion with criterion was low, that with all the other tests
except Terman 2 was also low.

Hoke 1 had a correlation of .11 with the criterion,
which was low, but the correlations with the other tests
were extremely low; namely, .17 with Terman 1, -.07 with
Terman 2, -.01 with Terman 8, -.33 with Terman 9, -.48 with
Terman 10. Combined with Terman 1 it decreased the score
of that test by one point, but it increased the score of
Terman 2 by .02, of Terman 8 by .02, of Terman 9 by .08,
and of Terman 10 by .10. It therefore looked as though
Hoke 1 would be a good test to include.

Hoke 2 showed a negative correlation.

Hoke 3 was omitted for reasons given above.

Hoke 4 appeared to be the best test, with a correlation
of .73 with the criterion.

Hoke 5 looked good, and Hoke 6 looked good.

The next step was to try out combinations with Terman
1, and so on until we found the best battery.

Twenty-two different batteries in all were assembled
and correlated with the criterion. The batteries and
correlations are shown in Appendix C of the Supplement.
On the pages showing the assembly of the batteries are
given the deviation from Mean and position by rank of
each pupil.

Before going further, it seemed a good idea to try
correlations of each unit test with the criterion by
the rank differences method to see how the figures com-
pared with the correlations by the Products Moments method.
This was done, and the working figures may be seen in
Appendix D of the Supplement.

A comparison of ranks by Products Moments method and
Rank Differences method follows:

		Products Moments Method	Rank Differences Method
Terman	1	✓.48	✓.52
	2	✓.38	✓.17
	3	✓.47	✓.44
	4	✓.23	✓.21
	5	✓.09	✓.10
	6	✓.40	✓.45
	7	✓.44	✓.42
	8	✓.45	✓.40
	9	✓.31	✓.39
	10	✓.27	✓.24
Hoke	1	✓.11	✓.06
	2	-.41	-.35
	3	✓.23	✓.24
	4	✓.73	✓.67
	5	✓.43	✓.46
	6	✓.47	✓.43
	7	✓.07	0
Tressler		✓.51	✓.33

Twenty-two different batteries in all were assembled
and correlated with the criterion. The batteries and
correlations are shown in Appendix 'C' of the Supplement.
On the pages showing the assembly of the batteries are
given the deviation from Mean and position by rank of
each pupil.

Before going further, it seemed a good idea to try
correlations of each unit test with the criterion by
the rank differences method to see how the figures com-
pared with the correlations by the Products Moments method.
This was done, and the working figures may be seen in
Appendix D of the Supplement.

A comparison of ranks by Products Moments method and
Rank Differences method follows:

		Products Moments Method	Rank Differences Method
Terman	1	+.48	+.52
	2	+.38	+.17
	3	+.47	+.44
	4	+.23	+.21
	5	+.09	+.10
	6	+.40	+.45
	7	+.44	+.42
	8	+.45	+.40
	9	+.31	+.39
	10	+.37	+.24
Hoke	1	+.11	+.06
	2	-.41	+.35
	3	+.23	+.24
	4	+.73	+.67
	5	+.43	+.48
	6	+.47	+.42
	7	+.07	0
Tressler		+.21	+.22

It will be noted that on the whole there is not a great deal of difference between the correlations. The only striking difference is on Terman 2, where the correlation by the Rank Differences method is only /.17, whereas by the Products Moments method it is /.38. This variation may be explained by the fact that there were several scores of the same figure which might result in a distorted correlation by the Rank Differences method.

Now, we have a choice of seven batteries which show correlations of over /.76 with the criterion by the Products Moments method. The next step is to work out correlations with the criterion by the Rank Differences method for each of these seven batteries.

Preparatory to this work I prepared a chart showing the rank positions of each pupil in the criterion and in each of the seven batteries. It also seemed that it would be valuable to know the correlations by this method with Miss W's Book Ranks and Miss W's Estimated Ranks, so this was worked out on the same paper as the correlations with the criterion. The chart and working figures for these correlations are found in Appendix E of the Supplement.

Comparison of Best Batteries

Table XIV on page 39, shows a comparison of the seven best tests as follows: (1) correlation by Products Moments method with the criterion (2) correlation by Rank Difference method with the criterion (3) correlation by

It will be noted that on the whole there is not a
great deal of difference between the correlations. The
only striking difference is on Terman 2, where the
correlation by the Rank Differences Method is only .17,
whereas by the Products Moments method it is .36. This
variation may be explained by the fact that there were
several scores of the same figure which might result in
a distorted correlation by the Rank Differences method.
Now, we have a choice of seven batteries which show
correlations of over .76 with the criterion by the
Products Moments method. The next step is to work out
correlations with the criterion by the Rank Differences
method for each of these seven batteries.

Preparatory to this work I prepared a chart showing
the rank positions of each pupil in the criterion and in
each of the seven batteries. It also seemed that it
would be valuable to know the correlations by this method
with Miss W's Book Ranks and Miss W's Estimated Ranks, so
this was worked out on the same paper as the correlations
with the criterion. The chart and working figures for
these correlations are found in Appendix B of the Supplement.

Comparison of Best Batteries

Table XIV on page 30, shows a comparison of the
seven best tests as follows: (1) correlation by Products
Moments method with the criterion (2) correlation by Rank
Difference method with the criterion (3) correlation by

Rank Differences method as to Miss W's here noted, and (4) correlation by Estimated Ranks computed with what is Estimated Ranks.

In looking over this table, it seemed that one of the batteries stood out quite strongly, and that there was really little choice between them, viz: Batteries

Table XIV

CORRELATION COMPARISON

Batteries	Products Moments	Rank Diff.	Miss W. Book	Miss W. Estimate
1,2,9,10, H. 1,4	.769	.62	.64	.71
1,2,8,9,10, H. 1,4	.760	.66	.64	.74
3,7,8,9,10, H. 1,4, -2	.772	.71-	.63	.78-
1,2,8,9,10, H. 1,4-2	.792	.71-	.67	.78-
1,8,9,10, H. 1,4-H2	.7832	.70	.65	.76
1,2,5,8,9,10, H. 1,4-H2	.768	.64	.60	.76
1,2,9,10, H. 1,4-2	.786	.68	.64	.76

Table XIV

CORRELATION COMPARISON

Batteries	Products Moments	Rank Diff.	Miss W. Book	Miss W. Estimate
1,2,9,10, H.1.4	.769	.62	.64	.71
1,2,8,9,10, H.1.4	.760	.66	.64	.74
1,3,7,8,9,10, H.1.4.-2	.772	.71-	.63	.78-
1,2,8,9,10, H.1.4-2	.792	.71-	.67	.78-
1,8,9,10, H.1.4-H2	.783	.70	.65	.76
1,2,3,8,9,10, H.1.4-H2	.768	.64	.60	.76
1,2,9,10, H.1.4-2	.786	.68	.64	.76

Rank Differences method with Miss W's Book Ranks, and
(4) correlation by Rank Differences method with Miss W's
Estimated Ranks.

In looking over this table, it seemed that two of the
batteries stood out quite strongly, and that there was
really little choice between them; viz: Batteries
1-3-7-8-9-10-Hoke 1-4 Minus 2, with correlations $\neq$.772,
$\neq$.71, $\neq$.63 and $\neq$.78, respectively; and Battery 1-2-8-9-10-
Hoke 1-4 Minus Hoke 2 with correlations of $\neq$.792, $\neq$.71,
$\neq$.67, and $\neq$.78, respectively. In fact, they were so close
that there was little choice between them. Before making
a final choice, however, two more tables were compiled for
reference: (1) a comparison of ranks of Miss W with
Criterion (Table XV, page 41) and (2) a comparison of ranks
on the criterion and on each of the seven tests by position
of pupil (Table XVI, page 42).

The latter table is rather interesting in that is shows
very plainly that most of the pupils listed did not vary
a great deal in the rank which they would attain according
to any of the different batteries given on this table.

Comparison of Ranks and Positions

The first three pupils are approximately in the same
location on the criterion and on either battery. The
fourth pupil ranks $3\frac{1}{2}$ on the criterion and anywhere from
9 to $13\frac{1}{2}$ on the different tests. She obviously did not
do well on any of the tests.

Rank Differences method with Miss W's Book Ranks, and

(4) correlation by Rank Differences method with Miss W's

Estimated Ranks.

In looking over this table, it seemed that two of the

batteries stood out quite strongly, and that there was

really little choice between them; viz: Batteries

1-3-7-8-9-10-Hoke 1-4 Minus 2, with correlations .772,

.71, .62 and .78, respectively; and Battery 1-2-8-9-10-

Hoke 1-4 Minus Hoke 2 with correlations of .792, .71,

.67, and .78, respectively. In fact, they were so close

that there was little choice between them. Before making

a final choice, however, two more tables were compiled for

reference: (1) a comparison of ranks of Miss W with

Criterion (Table XV, page 41) and (2) a comparison of ranks

on the criterion and on each of the seven tests by position

of pupil (Table XVI, page 42).

The latter table is rather interesting in that is shows

very plainly that most of the pupils listed did not very

a great deal in the rank which they would attain according

to any of the different batteries given on this table.

Comparison of Ranks and Positions

The first three pupils are approximately in the same

location on the criterion and on either battery. The

fourth pupil ranks 2½ on the criterion and anywhere from

9 to 12½ on the different tests. She obviously did not

do well on any of the tests.

Table XV

COMPARISON OF POSITION

Miss W Ranks and Criterion

	Miss W Book	Miss W Estimated	Criterion
1	Belkin	Ballantine	Corson
2	Ballantine	Adcock	Ballantine
3	Adcock	Spencer	$3\frac{1}{2}$ (Belkin
4	MacDougal	Uhlin	(Spencer
5	Spencer	MacDougal	$5\frac{1}{2}$ (Adcock
6	Corson	Belkin	(MacDougal
7	Cardillo	Corson	Haley
8	Haley	McCauley	McIntosh
9	Uhlin	DeMarco	Uhlin
10	DeMarco	McIntosh	$10\frac{1}{2}$ (DeMarco
11	Lyden	Cunniffe	(LaChapelle
12	McCauley	Haley	$12\frac{1}{2}$ (Cunniffe
13	McIntosh	Lyden	(McCauley
14	Cunniffe	Gibson	Lyden
15	Greene	Greene	Hebert
16	Hebert	Hebert	Cardillo
17	Gibson	LaChapelle	Greene
18	LaChapelle	Cardillo	Giordano
19	Stebner	Stebner	Gibson
20	Giordano	Giordano	Annunziata
21	Annunziata	Annunziata	Stebner

Table XV

COMPARISON OF POSITION

Miss W Ranks and Criterion

Criterion	Miss W Estimated	Miss W Book
Corson	Ballantine	1 Belkin
Ballantine	Adcock	2 Ballantine
3½ (Belkin) (Spencer)	Spencer	3 Adcock
	Uhlin	4 MacDougal
5½ (Adcock) (MacDougal)	MacDougal	5 Spencer
	Belkin	6 Corson
Haley	Corson	7 Cardillo
McIntosh	McCauley	8 Haley
Uhlin	DeMarco-	9 Uhlin
10½ (DeMarco) (LaChapelle)	McIntosh	10 DeMarco-
	Cunniffe	11 Lyden
12½ (Cunniffe) (McCauley)	Haley	12 McCauley
	Lyden	13 McIntosh
Lyden	Gibson	14 Cunniffe
Hebert	Greene	15 Greene
Cardillo	Hebert	16 Hebert
Greene	LaChapelle	17 Gibson
Giordano	Cardillo	18 LaChapelle
Gibson	Stebner	19 Stebner
Annunziata	Giordano	20 Giordano
Stebner	Annunziata	21 Annunziata

Table XVI

COMPARISON OF POSITION

CRITERION AND SEVEN BEST TESTS

	Criterion	.769	.760	.772	.792	.783	.768	.786
1	Corson	McCauley	McCauley	Spencer	Ballantine	Ballantine	Ballantine	Ballantine
2	Ballantine	Ballantine	Adcock	Ballantine	Spencer	Spencer	Cunniffe	Spencer
3	{Belkin	Adcock	Ballantine	{Adcock	Adcock	Cunniffe	{Adcock	Cunniffe
4	{Spencer	Spencer		{Cunniffe	Cunniffe	Adcock	{McCauley	
5	{Adcock	Cunniffe	McCauley	McCauley	McCauley	McCauley		{Corson
6	{MacDougal	Greene	Corson	Corson	Corson	Greene	Greene	{Lyden
7	Haley	MacDougal	{Lyden	MacDougal	MacDougal	Lyden	MacDougal	MacDougal
8	McIntosh	Lyden	{MacDougal	Lyden	Lyden	Corson	Corson	Greene
9	Uhlin	Belkin	Greene	Greene	Greene	Uhlin	Uhlin	Greene
10	{DeMarco	{Belkin	Lyden	Haley	Haley	Haley	MacDougal	Haley
11	{LaChapelle	{Corson	LaChapelle	Uhlin	Uhlin	Uhlin	Haley	Uhlin
12	{Cunniffe	Haley	Haley	LaChapelle	McIntosh	McIntosh	Belkin	LaChapelle
13	{MacCauley	Uhlin	Belkin	Haley	LaChapelle	{LaChapelle	McIntosh	Belkin
14	Lyden	Cardillo	McIntosh	Belkin	Belkin	{Belkin	{DeMarco	DeMarco
15	Hebert	{DeMarco	Cardillo	McIntosh	DeMarco	Cardillo	McIntosh	McIntosh
16	Cardillo	{McIntosh	DeMarco	Cardillo	Cardillo	DeMarco	Cardillo	Cardillo
17	Greene	Hebert	Hebert	DeMarco	DeMarco	Hebert	Hebert	Hebert
18	{Gibson	Giordano	{DeMarco	Hebert	Hebert	{Giordano	{Giordano	Hebert
19	{Giordano	Gibson	{Cardillo	Giordano	Giordano	{Cardillo	Gibson	Gibson
20	Annunziata	Annunziata	Gibson	Gibson	Gibson	Gibson	Annunziata	{Annunziata
21	Stebner	Stebner	Stebner	Annunziata	Annunziata	Annunziata	Stebner	{Stebner

This girl has an unusually high speed in typing and so far as her school ranks are concerned, she is the first in rank in the class, but Miss W has placed her as number 6 in her estimate of success. The girl is very careless and impetuous, and it is possible that in actual work the prediction of the test would be nearer than that of the criterion. Of course, this is hard to say.

The next girl seems to be placed correctly in both test and criterion. The following girl, Corson, receives a rank of one on the criterion and anywhere from 5 to $9\frac{1}{2}$ on the tests. This girl received a rank of 6 according to the book rank, and of 7 according to estimated ability, so it is possible that there again the battery estimate may be correct. She is placed sixth on both test $\not\!\!\!/.772$ and test $\not\!\!\!/.792$.

The next girl, Cunniffe, is away out of line in her battery tests. Her criterion rank was $12\frac{1}{2}$, whereas her test ranks vary from 2 to 5. There is no doubt that the prediction is wrong in this case, as her ability is manifestly below the average of the class. Miss W places her fourteenth on her book records and eleventh on her estimated ability.

DeMarco is somewhat out of line. Her criterion is $10\frac{1}{2}$ and her test ranks range from 14 to 17. However, this difference is not serious enough to think much about. She is probably correctly placed on the criterion.

This girl has an unusually high speed in typing and
so far as her school rank is concerned, she is the
first in rank in the class, but Miss T has placed her as
number 6 in her estimate of success. The girl is very
careless and impetuous, and it is possible that in actual
work the prediction of the test would be nearer than that
of the criterion. Of course, this is hard to say.

The next girl seems to be placed correctly in both
test and criterion. The following girl, Corson, receives
a rank of one on the criterion and anywhere from 5 to 9½
on the tests. This girl received a rank of 6 according to
the book rank, and of 7 according to estimated ability,
so it is possible that there again the battery estimate
may be correct. She is placed sixth on both test 4.772
and test 4.792.

The next girl, Cunniffe, is away out of line in her
battery tests. Her criterion rank was 12½, whereas her
test ranks vary from 2 to 5. There is no doubt that the
prediction is wrong in this case, as her ability is
manifestly below the average of the class. Miss T placed
her fourteenth on her book records and eleventh on her
estimated ability.

DeMarco is somewhat out of line. Her criterion is
10½ and her test ranks range from 14 to 17. However,
this difference is not serious enough to think much about.
She is probably correctly placed on the criterion.

Gibson and Giordano seem to agree pretty well with tests and criterion.

Greene and Haley are very much out of line. Greene is ranked 17 on the criterion and received a rank of 15 in each of Miss W's ranks, but varies from 6 to 9 on the test batteries. From what I know of Greene, I should say that her prediction worked out very poorly with the tests.

Haley had a rank of 7 on the criterion, 8 on Miss W's book ranks, and 12 on Miss W's estimates. Her test ranks vary from 10 to 13, so that probably her criterion rank is wrong.

Hebert and LaChapelle's criterion and test ranks are very close.

Lyden's criterion rank is 14, her book rank 11, and her estimated rank 13. Her test ranks vary from $7\frac{1}{2}$ to 10.

MacDougal seems to tally pretty well with predictions on the tests which we will use.

McCauley is way out of line on her criterion and prediction ranks. On two tests she was given the prediction of 2, but on the tests which we will use her rank is given as 5 and $7\frac{1}{2}$. Her criterion rank was $12\frac{1}{2}$, Miss W's book rank was 12, and her estimated rank was 8. It is probably safe to assume that she may come up to Miss W's estimate and in that case, her prediction is all right, but her criterion is wrong.

Gibson and Giordano seem to agree pretty well with tests and criterion.

Greene and Haley are very much out of line. Greene is ranked 17 on the criterion and received a rank of 15 in each of Miss W's ranks, but varies from 6 to 9 on the test batteries. From what I know of Greene, I should say that her prediction worked out very poorly with the tests.

Haley had a rank of 7 on the criterion, 8 on Miss W's book ranks, and 12 on Miss W's estimates. Her test ranks vary from 10 to 13, so that probably her criterion rank is wrong.

Hebert and LaChapelle's criterion and test ranks are very close.

Lyda's criterion rank is 14, her book rank 11, and her estimated rank 13. Her test ranks vary from 7½ to 10.

MacDougal seems to tally pretty well with predictions on the tests which we will use.

McCauley is way out of line on her criterion and prediction ranks. On two tests she was given the prediction of 2, but on the tests which we will use her rank is given as 5 and 7½. Her criterion rank was 12½, Miss W's book rank was 12, and her estimated rank was 8. It is probably safe to assume that she may come up to Miss W's estimate and in that case, her prediction is all right, but her criterion is wrong.

McIntosh was placed at 8 on the criterion, 13 on Miss W's book, and 10 on Miss W's estimate. Her ranks on the tests run from 12 to 15½.

The predictions of Spencer, Stebner, and Uhlin seem to be rather close to actual conditions.

Analysis of Group A and B Records

Logically, the decision as to which battery would finally be the best should be decided by means of the group used for the criterion. It would seem, however, that either of the two batteries might be used with equal chances of success so far as this group is concerned. The difference is so small in the correlations that it would come within the probable error of either.

Therefore, we will try out the prediction of each of the two best batteries on Groups A and B to see if we can then decide which would be the better.

One thing we must keep in mind, however, in considering these groups, is that the tests are designed to be used on a group who has not yet studied shorthand. Group A was having its second year of shorthand and Group B its first when the tests were taken. This means that each group will get a different range of scores in each test than would be expected from a group who had previously had the same amount of experience as Group C at the time of taking the tests.

We shall make comparisons in the following manner for each battery: (1) list the names in the order in which they rank on the tests, with test scores and school grades

McIntosh was placed at 6 on the criterion, 12 on
Miss W's book, and 10 on Miss ?'s estimate. Her ranks on
the tests run from 12 to 164.

The predictions of Spencer, Stebner, and Uhlin seem to
be rather close to actual conditions.

Analysis of Group A and B Records

Logically, the decision as to which battery would
finally be the best should be decided by means of the group
used for the criterion. It would seem, however, that either
of the two batteries might be used with equal chances of
success as far as this group is concerned. The difference is
so small in the correlations that it would come within the
probable error of either.

Therefore, we will try out the prediction of each of
the two best batteries on Groups A and B to see if we can
then decide which would be the better.

One thing we must keep in mind, however, in considering
these groups, is that the tests are designed to be used on
a group who has not yet studied shorthand. Group A was having
its second year of shorthand and Group B its first when the
tests were taken. This means that each group will get a
different range of scores in each test than would be expected
from a group who had previously had the same amount of ex-
perience as Group C at the time of taking the tests.

We shall make comparisons in the following manner
for each battery: (1) List the names in the order in which
they rank on the tests, with test scores and school grades

indicated; (2) count the number of A's, B's, C's, and D's or X's. (X is such a low passing grade that I am placing it with D) (3) Note how many A's are within the A range, how many B's within the B range, etc. (4) Compare the results of the two batteries.

Table XVII, pages 47 to 49 inclusive, show the scores and school grades within the range of each school grade for Group A and B on Battery 3-7-8-9-10-Hoke 1-4 minus Hoke 2.

Table XVIII, pages 50 to 52 inclusive, show the scores and school grades within the range of each school grade for Group A and B on Battery 1-2-8-9-10-Hoke 1-4 minus Hoke 2.

Table XIX, on page 53 shows the number in each group who are in position, 1 position away, two positions away, and three positions away from where they belong according to their battery score.

It will be noted from this that Battery 3-7-8-9-10-Hoke 1-4 minus Hoke 2 is a little better in placing the two lower groups. As that is the object in which we are most interested, we will select that for our best battery.

In this battery there is a total of twenty-six pupils out of a total of fifty-one in Group A who are correctly placed according to the office record of their ranks. We could have set a critical score of 120 below which a pupil would not be advised to go on, and only two (Adams and Moran) would have been wrongly advised. Terestre, with a grade of "B" was totally unfit for practical work.

indicated; (2) count the number of A's, B's, C's, and D's
or X's. (X is such a low passing grade that I am placing
it with D) (3) Note how many A's are within the A range,
how many B's within the B range, etc. (4) Compare the re-
sults of the two batteries.

Table XVII, pages 47 to 49 inclusive, show the scores
and school grades within the range of each school grade for
Group A and B on Battery 3-7-8-9-10-Hoke 1-4 minus Hoke 2.

Table XVIII, pages 50 to 52 inclusive, show the scores
and school grades within the range of each school grade
for Group A and B on Battery 1-2-8-9-10-Hoke 1-4 minus
Hoke 2.

Table XIX, on page 53 shows the number in each group
who are in position, 1 position away, two positions away,
and three positions away from where they belong according
to their battery score.

It will be noted from this that Battery 3-7-8-9-10-
Hoke 1-4 minus Hoke 2 is a little better in placing the two
lower groups. As that is the object in which we are most
interested, we will select that for our best battery.

In this battery there is a total of twenty-six pupils
out of a total of fifty-one in Group A who are correctly
placed according to the office record of their rating. We
could have set a critical score of 150 below which a pupil
would not be advised to go on, and only two (Adams and
Moran) would have been wrongly advised. Terestre, with a
grade of "B" was totally unfit for practical work.

Table XVII

	3	7	8	9	10	1	4	Total	Minus Hoke 2	Score	School Grade	
GROUP A												
Chandler, F	30	19	18	18	20	65	94	264	71	193	A	
Rynn	10	8	10	13	20	100	86	247	70	177	C	"A" range
MacDonald	30	16	16	15	16	62	84	239	62	177	A	
Bachmann	30	19	10	13	22	71	80	245	70	175	C	
Bilton	24	19	14	13	22	90	62	244	74	170	B	
Donnellan	18	14	12	13	16	80	96	249	84	165	C	
Walz	28	19	10	15	16	64	78	230	66	164	B	
Ford	26	16	10	14	20	72	64	222	59	163	B	
Weymouth	18	10	8	13	14	84	78	225	62	163	D	
Pottle	28	15	14	14	16	65	76	228	65	163	B	
Winchenbaugh	28	14	12	15	14	79	74	236	74	162	B	
Doyle	26	17	18	15	16	67	58	217	56	161	B	
Johnson	19	15	12	15	24	84	60	229	75	154	C	
Murphy	30	17	14	16	22	56	62	217	68	149	B	"B" range
Englund	20	18	14	15	14	70	66	217	68	149	B	
Falzone	28	13	6	13	6	83	62	211	65	146	B	
Jones	18	16	6	12	14	76	74	216	70	146	B	
Deehan	14	15	10	15	6	70	86	216	70	146	B	
Morash	19	19	15	17	22	60	54	206	62	144	A	
Hebert	26	13	10	14	4	76	62	205	66	139	X	
Fawson	28	15	8	16	20	64	62	213	74	139	A	
Gilbert	26	9	12	14	4	78	66	209	71	138	D	
Hunt	22	17	11	14	18	56	66	204	68	136	B	
Cardillo	21	13	4	11	8	83	60	200	67	133	B	
Hogan	24	12	15	14	16	54	56	191	61	131	B	
Mahan,	19	15	8	12	14	77	50	195	66	129	C	
Taylor, F.E.	26	14	10	14	16	48	72	200	71	129	C	
Maines	17	15	11	16	22	70	52	203	74	129	B	
Eaton	26	19	8	13	14	63	48	191	63	128	D	
Viscogliosi	26	13	9	12	2	66	62	190	62	128	D	
Magnuson	18	10	6	13	20	78	56	201	78	123	B	"C" range
Strem	18	11	9	16	16	65	62	197	77	120	C	
Adams	14	10	6	11	12	70	66	189	70	119	A	
Keirstead	20	13	4	13	14	66	54	184	68	116	X	
McKenzie	24	11	4	14	10	73	52	188	72	116	X	
Terestre	8	7	7	12	2	90	54	180	66	114	B	
Gaines	12	10	8	13	18	75	46	182	70	112	C	
Pattan	22	12	0	14	12	64	62	186	74	112	C	
Taylor	14	15	8	12	14	70	40	173	62	111	C	
Robbins	14	7	6	14	14	79	52	186	75	111	C	
Huntley	24	7	8	12	2	68	64	185	75	110	C	

Table XVII

GROUP A

	3	7	8	9	10	1	4	Total 2	Score	Minus Hoke Score	Grade school
Teacher "A"											
Chandler, P.	30	19	18	18	20	65	94	264	71	193	A
Ryan	10	8	10	13	20	100	98	247	70	177	C
MacDonald	30	16	16	16	15	62	94	259	62	177	A
Bachmann	30	19	10	15	22	71	80	245	70	175	C
Bilton	24	19	14	13	22	90	62	244	74	170	B
Teacher "B"											
Donnellan	18	14	17	12	15	60	96	249	84	165	C
Wain	28	19	10	15	16	64	78	230	66	164	B
Ford	26	16	10	14	20	72	64	222	59	163	B
Weymouth	18	10	8	13	14	64	78	225	62	163	D
Pottle	28	16	14	14	16	65	76	228	65	163	B
Winchenbaugh	28	14	12	15	14	79	74	236	74	162	B
Doyle	26	17	18	17	16	67	58	217	56	161	B
Johnson	19	15	12	15	24	64	60	229	75	154	C
Murphy	30	17	14	16	22	56	56	217	68	149	B
Englund	20	18	14	15	14	70	68	217	68	149	B
Falzone	28	15	8	15	6	85	62	211	65	148	B
Jones	18	16	8	13	14	76	74	216	70	146	B
Deehan	14	15	10	15	9	70	86	216	70	146	B
Morgan	19	19	15	17	22	60	54	206	62	144	A
Hebert	26	13	10	14	4	76	65	205	66	139	X
Rawson	28	15	8	16	20	64	82	213	74	139	A
Gilbert	26	9	15	14	7	78	68	209	71	138	D
Hunt	22	17	11	14	18	56	66	204	68	136	B
Teacher "C"											
Gardillo	21	15	4	11	8	85	60	200	67	133	B
Hogan	24	12	15	14	16	54	56	191	61	131	B
Mahan,	16	15	8	15	14	77	50	196	66	129	C
Taylor, F.E.	28	14	10	14	18	48	72	200	71	129	C
Maines	17	15	11	16	22	70	52	203	74	129	B
Eaton	22	16	8	13	14	66	48	191	63	128	D
Viscogliosi	26	15	8	9	12	2	66	190	62	128	D
Magnuson	18	10	6	13	20	76	58	201	78	123	B
Strem	18	11	9	16	16	66	62	197	77	120	C
Adams	14	10	8	11	18	70	66	189	70	119	A
Keirstead	20	15	4	15	14	66	54	184	68	116	X
McKenzie	24	11	4	14	10	72	58	188	72	116	X
Tereatre	8	7	7	12	2	90	54	180	66	114	B
Baines	16	10	8	13	16	75	46	182	70	116	C
Patten	22	12	0	14	12	64	62	186	74	116	C
Taylor	14	16	8	14	13	70	40	173	62	111	D
Robbins	17	7	8	14	14	79	58	186	75	111	C
Huntley	24	7	8	13	2	64	58	188	75	110	C

Table XVII

GROUP A

	3	7	8	9	10	1	4	Total	Minus Hoke 2	Score	School Grade	
Meegan	15	17	0	11	12	67	54	176	66	110	C	
Rippen	14	11	2	14	14	60	56	171	61	110	C	
Parkinson	16	15	5	12	20	65	60	193	84	109	D	"D" range
Leishman	20	15	8	13	8	70	54	188	82	106	C	
Moran	16	9	6	11	12	69	56	179	75	104	B	
Rynn, H	16	9	8	12	6	66	62	179	78	101	C	
Waterman	18	15	2	13	16	61	56	181	83	98	X	
Phillips	24	12	9	12	6	48	58	169	80	89	C	
Merino, J.	22	7	4	12	16	63	42	166	80	86	X	
Slacke	8	7	2	12	14	61	46	150	79	71	C	

Table XVII

GROUP B

	3	7	8	9	10	1	4	Total	Minus Hoke 2	Score	School Grade	
Donnellan	26	18	16	18	16	69	72	235	74	161	A	
Faulkner	22	18	9	14	20	72	54	209	50	159	D	"A" range
Beebe	28	18	11	14	16	67	58	212	55	157	D	
Shields	16	14	12	13	14	63	74	206	56	150	B	
Tomlin	16	14	12	12	12	75	62	203	56	147	B	
Dwyer	14	16	11	12	16	70	58	197	51	146	X	
Davis	22	19	12	15	22	66	62	218	73	145	A	
Papazian	28	8	10	17	14	66	62	205	62	143	A	
Turner	19	14	6	16	18	65	64	202	59	143	A	
Trudo	20	18	14	16	22	66	44	200	57	143	D	"B" range
Coleman	30	13	9	15	18	65	50	200	59	141	A	
Siano	13	12	9	14	20	75	70	213	76	137	X	
Sousa	18	16	13	14	20	57	56	194	58	136	C	
Locke	30	17	7	14	14	72	52	206	72	134	A	
Mace	16	16	6	10	14	68	54	184	53	131	B	
Banks	17	18	13	12	12	66	60	198	68	130	D	
Casella	17	12	7	14	20	70	48	188	61	127	B	"C" range
Rogers	15	14	10	12	14	69	58	192	65	127	B	
Young	10	17	8	14	20	80	34	183	62	121	X	
Floridia	15	11	7	10	16	73	46	178	62	116	C	
Wasson	22	13	2	13	20	70	44	184	70	114	B	
Hawthorne	19	10	8	14	18	51	50	170	57	113	D	
Prescott	16	10	7	10	12	74	54	183	70	113	X	
Taylor	8	13	2	13	16	77	52	181	70	111	C	
McKenzie	10	14	6	14	12	53	56	165	56	109	B	
Storer	18	12	1	13	10	69	60	183	74	109	C (Repeated)	
Zink	9	12	2	13	14	74	48	172	63	109	D	"D" or "X" range
Keyes	16	18	10	13	2	59	46	164	58	106	D	
Wilson	24	11	7	13	14	66	38	173	68	105	X	
Towers	20	5	9	14	12	60	36	156	56	100	D	
Powers	8	3	5	12	6	84	44	162	70	92	D	
Phillips	12	9	12	10	10	68	36	157	66	91	X	
Ristucia	13	11	8	12	14	68	48	174	84	90	B	
Boudreau	16	8	5	14	2	64	30	139	62	77	C (Repeated)	
Roberts	12	7	0	6	8	49	42	124	52	72	C	
O'Donnell	7	11	4	12	6	55	18	113	56	57	D	

Table XVII

GROUP B

Name	3	7	8	9	10	1	4	Total 2	2	Score	Minus Hoke Score	Grade
Donnellan	26	18	18	16	18	16	69	72	255	74	181	A
Faulkner	22	18	9	17	14	20	72	54	209	50	159	D
Beebe	28	18	11	17	14	16	67	58	212	55	157	D
Shields	16	14	18	13	14	15	63	74	205	56	150	B
Tomlin	16	14	16	13	13	15	75	62	205	58	147	B
Dwyer	14	16	11	13	15	16	70	58	197	51	146	X
Davis	22	18	13	15	16	22	66	62	218	73	145	A
Papazian	28	8	9	10	17	14	66	62	205	62	143	A
Turner	19	14	9	16	16	18	65	62	202	59	143	A
Trudo	20	18	14	16	22	16	66	44	200	57	143	D
Coleman	30	15	9	15	18	16	65	50	200	59	141	A
Siano	13	15	9	14	9	20	75	70	215	76	137	X
Sousa	18	16	15	16	14	20	57	56	194	58	136	C
Locke	30	17	7	14	14	72	62	206	72	134	A
Mace	16	16	9	13	10	14	68	54	184	53	131	B
Banks	17	18	13	15	12	16	66	60	198	68	130	D
Casella	17	18	7	14	20	70	48	188	61	127	B
Rogers	15	14	10	12	14	69	58	192	66	127	B
Young	10	17	8	14	20	30	54	163	62	121	X
Floridia	15	11	7	10	18	72	46	178	62	116	C
Wasson	22	13	5	13	15	20	70	44	184	70	114	B
Hawthorne	19	10	8	14	18	61	60	170	67	113	D
Prescott	16	10	7	10	15	74	54	185	70	113	X
Taylor	8	15	5	16	15	77	52	181	70	111	C
McKenzie	10	14	8	14	15	53	56	166	58	109	B
Storer	18	15	7	13	10	60	60	183	74	109	C
Zink	9	15	5	14	14	48	172	63	109	D
Keyes	16	18	10	13	5	59	46	164	58	106	D
Wilson	24	11	7	15	14	66	38	175	68	105	X
Towers	20	5	8	14	15	60	36	156	56	100	D
Powers	12	5	5	16	5	84	44	162	70	95	D
Phillips	15	9	15	10	10	65	56	157	66	91	X
Blatchia	16	11	8	15	14	68	48	174	84	90	B
Bourbeau	16	8	5	14	5	64	50	159	62	77	C
Roberts	15	7	0	6	8	45	42	124	62	72	C
O'Donnell	7	11	4	15	6	52	18	113	56	57	D

Table XVIII

GROUP A

	1	2	8	9	10	1	4	Total	Minus Hoke 2	Score	School Grade	
Chandler	18	20	18	18	20	65	94	255	71	184	A	
Rynn	8	14	10	13	20	100	86	251	70	181	C	"A" range
Jones	15	22	6	12	14	76	74	239	70	169	B	
MacDonald	17	20	16	15	16	62	84	230	62	168	A	
Weymouth	15	18	8	13	14	84	78	230	62	168	D	
Donnellan	11	20	12	13	16	80	96	248	84	164	C	
Bachmann	17	20	10	13	22	71	80	233	70	163	C	
Bilton	13	20	14	13	22	90	62	234	74	160	B	
Pottle	16	22	14	14	16	65	76	223	65	158	B	
Walz	18	22	10	15	16	64	78	223	66	157	B	
Ford	13	22	10	14	20	72	64	215	59	156	B	
Winchenbaugh	18	18	12	15	14	79	74	230	74	156	B	
Johnson	13	22	12	15	24	84	60	230	75	155	C	
Doyle	15	20	18	15	16	67	58	209	56	153	B	
Englund	15	20	14	15	14	70	66	214	68	146	B	"B" range
Deehan	10	16	10	15	6	70	86	213	70	143	B	
Murphy	17	22	14	16	22	56	62	209	68	141	B	
Morash	14	20	15	17	22	60	54	202	62	140	A	
Hebert	17	18	10	14	4	76	62	201	66	135	X	
Gilbert J	16	16	12	14	4	78	66	206	71	135	D	
Hunt	16	22	11	14	18	56	66	203	68	135	B	
Cardillo	11	22	4	11	8	83	60	199	67	132	B	
Fawson	18	18	8	16	20	64	62	206	74	132	A	
Mahan	17	18	8	12	14	77	50	196	66	130	C	
Falzone	12	12	6	13	6	83	62	194	65	129	B	
Terestre	13	14	7	12	2	90	54	192	66	126	B	
Magnuson	15	16	6	13	20	78	56	204	78	126	B	
Viscogliosi	18	18	9	12	2	66	62	187	62	125	D	
Robbins	12	22	6	14	14	79	52	199	75	124	C	
Adams	15	14	6	11	12	70	66	194	70	124	A	
Maines	15	12	11	16	22	70	52	198	74	124	B	
Rippen	14	22	2	14	14	60	56	182	61	121	C	"C" range
Hogan	6	20	15	14	16	54	56	181	61	120	B	
McKenzie	17	22	4	14	10	73	52	192	72	120	X	
Taylor, F.E.	15	16	10	14	16	48	72	191	71	120	C	
Gaines	11	16	8	13	18	75	46	187	70	117	C	
Keirstead	16	18	4	13	14	66	54	185	68	117	X	
Eaton	15	18	8	13	14	63	48	179	63	116	D	
Strem	13	12	9	16	16	65	62	193	77	116	C	
Parkinson	15	20	5	12	20	65	60	197	84	113	D	
Taylor	13	18	8	12	14	70	40	175	62	113	C	

Table XVIII

GROUP A

Name	College Grade	1	2.	8	9	10	1	4	Total Z	Minus Hoke Z	Score
Chandler	A	18	20	18	18	20	65	94	255	71	184
Rynn	C	8	14	10	13	20	100	86	251	70	181
Jones	B	18	22	9	16	14	76	74	259	70	169
MacDonald	A	17	20	16	15	16	62	84	230	62	168
Weymouth	D	16	18	8	15	14	84	78	230	62	168
Donnellan	C	11	20	12	12	16	80	96	248	84	164
Bachmann	C	17	20	10	13	22	71	80	233	70	163
Bilton	B	13	20	14	13	15	90	62	234	74	160
Pottle	B	16	22	14	14	16	65	76	232	65	158
Walz	B	18	22	10	15	16	64	78	232	66	157
Ford	B	13	22	10	14	20	72	64	215	59	156
Winchenbaugh	B	18	18	12	15	14	79	74	230	74	156
Johnson	C	13	22	12	15	24	84	60	230	75	155
Doyle	B	16	20	18	13	16	67	58	209	56	153
England	B	16	20	14	13	14	70	66	214	68	146
Deehan	B	10	16	10	13	9	86	70	213	70	143
Murphy	B	17	22	16	13	22	56	62	209	68	141
Moragh	A	14	20	17	22	60	54	202	62	140	
Hebert	K	17	18	10	14	4	76	62	201	66	135
Gilbert J	D	16	16	18	14	4	78	66	206	71	135
Hunt	B	16	22	11	14	18	56	66	202	68	135
Cardillo	B	11	22	4	11	8	60	66	199	67	132
Fawson	A	18	18	8	16	20	64	62	206	74	132
Mahan	C	17	18	8	18	14	77	50	196	66	130
Paisone	B	15	18	8	15	8	63	62	194	65	129
Terrestre	B	13	14	7	12	2	90	54	192	66	126
Magruson	B	16	16	9	13	20	78	56	204	78	126
Viscogliosi	D	18	18	9	13	2	65	62	187	63	125
Robbins	C	18	22	9	14	14	79	52	199	75	124
Adams	A	16	14	9	11	16	70	68	194	70	124
Matias	B	18	15	11	18	22	16	70	188	74	124
Rippan	C	14	22	8	14	14	60	56	188	61	121
Hogan	B	9	20	18	14	16	54	66	181	61	120
McKenzie	X	17	22	4	14	10	73	52	192	72	120
Taylor, F.E.	C	16	16	10	14	16	48	72	191	71	120
Gaines	C	11	16	8	13	18	76	48	184	70	117
Keirstead	X	16	18	4	12	14	66	54	185	68	117
Eaton	D	16	16	8	12	14	63	48	179	63	116
Strem	C	13	18	9	13	16	66	62	182	77	116
Parkinson	D	16	20	5	12	20	65	60	187	84	113
Taylor	C	13	18	9	13	14	70	40	175	62	113

Table XVIII

GROUP A

	1	2	8	9	10	1	4	Total	Minus Hoke 2	Score	School Grade
Meegan	11	22	0	11	12	67	54	177	66	111	C
Patten	13	18	0	14	12	64	62	183	74	109	C
Moran	13	14	6	11	12	69	56	181	75	106	B
Rynn, H	11	18	8	12	6	66	62	183	78	105	C
Leishman	14	20	8	13	8	70	54	187	82	105	C
Waterman	13	20	2	13	16	61	56	184	73	101	X
Huntley	14	4	8	12	2	68	64	172	75	97	C
Slacke	12	22	2	12	14	61	46	169	79	90	C
Merino	15	16	4	12	16	63	42	168	80	88	X
Phillips	14	18	9	12	6	46	58	163	80	83	C

"D" or "X" range

Table XVIII

GROUP B

	1	2	8	9	10	1	4	Total	Minus Hoke 2	Score	School Grade	
Shields	16	20	12	13	14	63	74	212	56	156	B	
Tomlin	14	22	12	12	12	75	62	209	56	153	B	"A" range
Donnellan	15	20	16	18	16	69	72	226	74	152	A	
Faulkner	14	18	9	14	20	72	54	201	50	151	D	
Beebe	17	22	11	14	16	67	58	205	55	150	D	
Dwyer	14	18	11	12	16	70	58	199	51	148	X	
Davis	18	22	12	15	22	66	62	217	73	144	A	
Papazian	17	18	10	17	14	66	62	204	62	142	A	
Turner	14	18	6	16	18	65	64	201	59	142	A	
Trudo	13	22	14	16	22	66	44	197	57	140	D	"B" range
Coleman	18	22	9	15	18	65	50	197	59	138	A	
Siano	9	16	9	14	20	75	70	213	76	137	X	
Sousa	14	16	13	14	20	57	56	190	58	132	C	
Banks	17	18	13	12	12	66	60	198	68	130	D	
Casella	12	20	7	14	20	70	48	191	61	130	B	
Young	13	20	8	14	20	80	34	189	62	127	X	
Rogers	12	16	10	12	14	69	58	191	65	126	B	"C" range
Locke	17	20	7	14	14	72	52	196	72	124	A	
Wasson	12	20	2	13	20	70	44	191	70	121	B	
Mace	11	10	6	10	14	68	54	173	53	120	B	
Floridia	12	14	7	10	16	73	46	178	62	116	C	
Prescott	10	18	7	10	12	74	54	185	70	115	X	
Taylor	9	16	2	13	16	77	52	185	70	115	C	
McKenzie	13	16	6	14	12	53	56	170	56	114	B	
Zink	6	18	2	13	14	74	48	175	63	112	D	
Hawthorne	13	14	8	14	18	51	50	168	57	111	D	
Keyes	14	20	10	13	2	59	46	164	58	106	D	"D" or "X" range
Powers	7	14	5	12	6	84	44	172	70	102	D	
Storer	5	18	1	13	10	69	60	176	74	102	B	
Wilson	14	18	7	13	14	66	38	170	68	102	X	
Phillips	11	12	12	10	10	68	36	159	66	93	X	
Towers	6	10	9	14	12	60	36	147	56	91	D	
Ristuccia	4	10	8	12	14	68	48	164	84	80	C	
Roberts	10	16	0	6	8	49	42	131	52	79	C	
Boudreau	7	6	5	14	2	64	30	128	62	66	C	
O'Donnell	10	10	4	12	6	55	18	115	56	59	D	

Table XVIII

GROUP B

Name	1	2	8	9	10	1	4	Total 1	Total 2	Hoke Score	Minus Hoke	Grade School
Shields	16	20	13	13	15	14	65	74	212	56	156	B
Tomlin	14	22	12	12	13	13	63	75	209	56	153	B
Donnellan	15	20	16	16	18	16	69	72	226	74	152	A
Faulkner	14	18	9	14	9	20	72	54	201	50	151	D
Beebe	17	22	11	14	16	16	67	58	205	55	150	D
Dwyer	14	18	11	12	12	16	70	58	199	51	148	X
Davis	18	22	13	15	15	22	66	62	217	73	144	A
Papazian	17	18	10	17	14		66	62	204	62	142	A
Turner	14	18	9	16	18		65	64	201	59	142	A
Trudo	15	22	17	16	22		66	44	197	47	140	D
Coleman	18	22	9	15	18		65	50	197	59	138	A
Siano	9	16	9	14	20		75	70	213	76	137	X
Sousa	14	16	13	14	20		57	56	190	58	135	C
Banks	17	18	13	12	12		66	60	198	68	130	D
Casalia	12	20	7	14	20		70	48	191	61	130	B
Young	15	20	8	14	20		80	34	189	62	127	X
Rogers	15	18	10	12	14		69	58	191	65	126	B
Locke	17	20	7	14	14		72	52	196	72	124	A
Wasson	12	20	5	13	20		70	44	191	70	121	B
Mace	11	10	5	10	14		68	54	173	53	120	B
Floridia	12	14	7	10	16		73	46	178	62	116	C
Prescott	10	18	7	10	15		74	54	185	70	115	X
Taylor	9	16	9	18	2	16	77	52	185	70	115	C
McKenzie	15	16	9	13	14		53	56	170	56	114	B
Zink	9	18	2	13	14		74	48	175	63	112	D
Hawthorne	13	14	8	14	18		51	60	168	57	111	D
Keyes	14	20	10	13	2		56	46	164	58	106	D
Powers	7	14	5	12	9		84	44	172	70	102	D
Storer	5	18	1	15	10		69	60	176	74	102	B
Wilson	14	18	7	15	9		66	38	170	68	102	X
Phillips	11	15	12	10	10		68	36	159	64	95	X
Towers	9	10	14	9	12		60	36	147	56	91	D
Riatuccia	4	10	8	14	9		68	48	164	84	80	C
Roberts	10	16	0	5	8		49	42	131	52	79	D
Boudreau	7	6	5	14	2		64	30	128	62	68	C
O'Donnell	10	10	4	18	6		65	18	116	56	58	D

Table XIX

Analysis of Two Batteries

Battery 3-7-8-9-10-Hoke 1-4 minus Hoke 2

Group A

	In position	1 away	2 away	3 away
A	2	1	2	
B	11	4	3	
C	10	7	1	
D or X	3	6	1	
Total	26	18	7	

Group B

		1 away	2 away	3 away
A	1	2	0	3
B	0	6	2	
C	1	5	0	
D or X	11	2	3	
Total	13	15	5	3

Battery 1-2-8-9-10-Hoke 1-4 minus Hoke 2

Group A

	In position	1 away	2 away	3 away
A	2	1	1	1
B	11	5	2	
C	7	10	1	
D or X	2	7	1	
Total	22	23	5	1

Group B

		1 away	2 away	3 away
A	1	2	0	3
B	0	5	3	
C	0	5	1	
D or X	9	5	2	
Total	10	17	6	3

Table XIX

Analysis of Two Batteries

Battery 3-7-8-9-10-Hoke 1-4 minus Hoke 2

Group A

In position	1 away	2 away	3 away
A	2	1	2	
B	11	4	3	
C	10	7	1	
D or X	3	6	1	
Total	26	18	7	

Group B

In position	1 away	2 away	3 away
A	1	2	0	3
B	0	6	2	
C	1	5	0	
D or X	11	2	3	
Total	13	15	5	3

Battery 1-2-8-9-10-Hoke 1-4 minus Hoke 2

Group A

In position	1 away	2 away	3 away
A	2	1	1	1
B	11	5	2	
C	7	10	1	
D or X	2	7	1	1
Total	22	23	5	1

Group B

In position	1 away	2 away	3 away
A	1	2	0	3
B	0	6	3	
C	0	5	1	
D or X	9	2	2	
Total	10	17	6	3

In Group B we have rather a peculiar situation. Sixteen out of a group of thirty-six are recorded as failures. Two others of this group pass after repeating the course, and may be termed as failures in the sense that they were unable to pass with their class. In this group, if the critical score had been placed at 114, only two, Ristuccia and McKenzie, would have been wrongly advised. Roberts had a hard time with her shorthand, even after being tutored all summer.

The upper limits in both groups seem to give a poorer prediction. Apparently no reliance can be placed upon the size of the battery score in these two groups to predict the degree of success which one may expect.

Analysis of Group "C"

However, we are most interested in Group C, and this will be the one on which we make our final conclusions as to the predictive value of the battery.

We first list all who attempted shorthand in the order of their scores in Battery 3-7-8-9-10-Hoke 1-4 minus Hoke 2, placing against the names of those included in the criterion the difference between their score position and their criterion rank, and in the case of the others, the office record of their rank in shorthand which appears at the end of the Junior year, or when they stopped, or at present. See Table XX, page 55.

In Group B we have rather a peculiar situation. Sixteen out of a group of thirty-six are recorded as failures. Two others of this group pass after repeating the course, and may be termed as failures in the sense that they were unable to pass with their class. In this group, if the critical score had been placed at 114, only two, Blatuccio and McKenzie, would have been wrongly advised. Roberts had a hard time with her shorthand, even after being tutored all summer.

The upper limits in both groups seem to give a poorer prediction. Apparently no reliance can be placed upon the size of the battery score in these two groups to predict the degree of success which one may expect.

Analysis of Group "C"

However, we are most interested in Group C, and this will be the one on which we make our final conclusions as to the predictive value of the battery.

We first list all who attempted shorthand in the order of their scores in Battery 3-7-8-9-10-Hoke 1-4 minus Hoke 2, placing against the names of those included in the criterion the difference between their score position and their criterion rank, and in the case of the others, the critical record of their rank in shorthand which appears at the end of the junior year, or when they stopped, or at present.

See Table XX, page 85.

Table XX

GROUP C

	3	7	8	9	10	1	4	Total	Minus Hoke 2	Score	Diff. in rank	School grade
Spencer	24	19	18	16	22	50	80	229	59	170	2½	
Ballantine	26	16	12	14	20	68	70	226	57	169	0	
Adcock	28	17	16	14	16	67	74	232	68	164	2	
Cunniffe	24	20	14	15	18	66	64	221	57	164	9	
McCauley	24	15	14	13	18	77	70	231	74	157	7½	
Corson	24	18	10	15	12	77	56	212	56	156	5	
Draper	20	15	10	15	24	70	52	206	62	144		X
Lyden	20	15	6	11	20	76	52	200	57	143	6½	
MacDougal	16	17	8	13	24	74	52	204	61	143	2	
Greene	20	18	10	14	18	68	56	204	62	142	8	
Uhlin	24	17	10	13	14	69	52	199	58	141	1	
Britt	30	14	16	14	8	60	56	198	61	137		B
LaChapelle	28	16	6	12	18	67	62	209	74	135	½	
Haley	4	16	8	15	18	70	52	183	56	127	5	
Belkin	20	18	8	10	22	68	58	204	78	126	9½	
Holme	10	16	10	15	18	70	50	189	65	124		D
Hanson	22	17	8	14	8	63	40	172	52	120		X
Hoarde	12	10	12	13	14	76	50	187	68	119		C
McIntosh	8	15	16	13	18	65	46	181	62	119	6	
Bickford	8	15	11	9	14	65	50	172	57	115		C
Nutting	12	12	16	13	14	55	46	168	53	115		C
DeMarco	18	15	0	13	20	66	42	174	62	112	4½	
Hebert	26	14	8	13	14	64	44	183	75	108	1	
Cardillo	4	17	10	11	14	71	52	179	72	107	1	
Gibson	20	16	8	14	14	69	30	171	66	105	1	
Gardiner	5	11	10	13	19	70	34	161	57	104		X
Bamforth	12	11	12	11	18	73	38	175	75	100		D
Orpin	10	9	10	13	16	51	46	155	65	90		D
Giordano	4	8	10	12	20	66	36	156	70	86	1	
Stebner	12	18	0	13	22	48	30	143	68	75	1	
Delfino	8	15	8	14	10	61	20	136	62	74		D
Adams	12	14	2	15	12	38	20	113	48	65		D
Annunziata	0	7	6	11	6	80	30	140	78	62	1	
Needham	12	6	0	11	18	60	22	129	68	61		D

Table XX

GROUP C

| | Spencer | Ballantine | Adcock | Cunniffe | McCauley | Gowran | Draper | Lydon | MacDougal | Greene | Uhlin | Britt | LaChapelle | Haley | Belkin | Holme | Hanson | Hoarde | McIntosh | Blckford | Nutting | DeMarco | Hebert | Cardillb | Olmson | Gardiner | Bamforth | Orpin | Giordano | Stebner | Dolfino | Adams | Annunaeta | Needham |

We can see at once that the prediction of the lower limit of success is exceptionally good. It might be placed at 104 with injustice to no one, as all who are below that position are failures. Here, again, the upper limits show a much poorer prediction, but this does not vitiate the figures, as there are outside factors which may cause a girl of good ability to do poor work.

Two of the three cases of failure when the score was over 110 may be explained in this case as follows: Draper was very poor in beginning typewriting and was advised not to continue. Holme spent a great deal of time outside on music and left school about the middle of her Junior year with a record of failure in all subjects. There seems to be no available explanation for the failure of Hanson.

Conclusions

It would seem that Battery 3-7-8-9-10-Hoke 1-4 minus 2 (1) may be used successfully as a prediction for those who would not be successful if we set the lower limit at 104, with doubtful cases ranging from 105 to 110; (2) that because of difference in interest, amount of practice, and other conditions, the degree of success cannot be predicted from the attainment of any score on the battery, but that there is reason to believe that degree of natural ability is indicated to some extent by the size of the score attained; (3) that if we consider ranks in first year typewriting, English grammar, punctuation and spelling; and general personality of the girl together with the battery score we will get a fairly reliable prediction of the success of any pupil about to take up the study of stenography.

We can see at once that the prediction of the lower limit
of success is exceptionally good. It might be placed at 104
with injustice to no one, as all who are below that position
are failures. Here, again, the upper limits show a much
poorer prediction, but this does not vitiate the figures, as
there are outside factors which may cause a girl of good
ability to do poor work.

Two of the three cases of failure when the score was over
110 may be explained in this case as follows: Draper was
very poor in beginning typewriting and was advised not to
continue. Holme spent a great deal of time outside on music
and left school about the middle of her Junior year with a
record of failure in all subjects. There seems to be no
available explanation for the failure of Hanson.

Conclusions

It would seem that Battery 3-7-8-9-10-Hole 1-4 minus 2

(1) may be used successfully as a prediction for those who
would not be successful if we set the lower limit at 104, with
doubtful cases ranging from 105 to 110; (2) that because of
difference in interest, amount of practice, and other conditions
the degree of success cannot be predicted from the attainment
of any score on the battery, but that there is reason to be-
lieve that degree of natural ability is indicated to some ex-
tent by the size of the score attained; (3) that if we consider
ranks in first year typewriting, English grammar, punctuation
and spelling; and general personality of the girl together with
the battery score we will get a fairly reliable prediction of
the success of any pupil about to take up the study of stenography.

BIBLIOGRAPHY

Anderson, L. D. "The Minnesota Mechanical Ability Tests." Personal Journal 6 pages 473-478 (1928). A battery of three mechanical ability tests. Survey Work.

Ayres, L. P. Scale for measuring handwriting. Used this in correcting Hoke test 3.

Bartlett, E. D. A Practical Rating Scale. "Industrial Psychology." 2 pages 564-565, 567-569 (1921). An interesting discussion of the development of a rating scale by an employment manager. Survey work.

Bills, M. A. "A Test for Use in the Selection of Stenographers." "Journal of Applied Psychology." 5 pages 373-377 (1921) See thesis page 2.

Bills, M. A. "Methods for the Selection of Comptometer Operators and Stenographers." "Journal of Applied Psych." 5 pages 275-283 (1921) See thesis page 3.

Bills, M. A. "Predicting the Careers of Clerical Employees." Service Bulletin of the bureau of personal research. 5 pages 2-4 (1920) Survey work.

Bingham & Freyd "Procedures in Employment Psychology." 30-42 Read most of the book.

Brown, W. M. "A Study of the Predictive Value of Certain Kinds of Scores in Intelligence Tests." "Journal of Educational Psychology." 15 pages 448-461 (1924) Looked it through. Of no significance to problem investigated.

Burr, Emily O. "Minimum Intellectual Levels of Accomplishment in Industry." "Journal of Personal Research." 3 pages 210-211 (1925) Survey work.

Burtt, H. E. "Employment Psychology" 56 39-503. Read parts pertaining to thesis.

Charters & Whitley "Analysis of Secretarial Traits and Duties." pages 173-175 (1924) (Wilkins & Wilkins) This selection was taken from "Readings" pages 104-106. I tried to get the book but was unable to do so. My reaction to the article was unfavorable.

BIBLIOGRAPHY

Anderson, L. D. "The Minnesota Mechanical Ability Tests," Personal Journal 6 pages 473-478 (1928). A battery of three mechanical ability tests. Survey Work.

Ayres, L. P. Scale for measuring handwriting. Used this in correcting Hoke test 3.

Bartlett, E. D. A Practical rating Scale. "Industrial Psychology." 2 pages 564-565, 567-569 (1921). An interesting discussion of the development of a rating scale by an employment manager. Survey work.

Bills, M. A. "A Test for Use in the Selection of Stenographers." "Journal of Applied Psychology." 5 pages 373-377 (1921) See thesis page 2.

Bills, M. A. "Methods for the Selection of Comptometer Operators and Stenographers." "Journal of Applied Psychol." 5 pages 275-283 (1921) See thesis page 3.

Bills, M. A. "Predicting the Careers of Clerical Employees." Service Bulletin of the bureau of personal research. 5 pages 2-4 (1920) Survey work.

Bingham & Freyd "Procedures in Employment Psychology". 30-42 Read most of the book.

Brown, W. M. "A Study of the Predictive Value of Certain Kinds of Scores in Intelligence Tests." "Journal of Educational Psychology". 15 pages 448-461 (1924) looked it through. Of no significance to problem investigated.

Burr, Emily O. "Minimum Intellectual levels of Accomplishment in Industry". "Journal of Personal Research." 3 pages 210-211 (1925) Survey work.

Burtt, H. E. "Employment Psychology" 56 59-505. Read parts pertaining to thesis.

Charters & Whitley "Analysis of Secretarial Traits and Duties." pages 175-176 (1924) (Wilkins & Wilkins)- This selection was taken from "Headings" pages 104-106. I tried to get the book but was unable to do so. My reaction to the article was unfavorable.

BIBLIOGRAPHY

<u>Freyd, M.</u> "Selection of Typists and Stenographers."
    Information on available tests. "Journal of Personal
    Research." <u>5</u> pages 490-510 (1927) Reference

<u>Griffitts, C. H.</u> "Fundamentals of Vocational Psychology."
    pages 132-138 The MacMillan Co. (1924) Looked it over.

<u>Gronert, M. L.</u> "A Prognostic Test in Typewriting" "Journal
    of Educational Psychology" <u>16</u> pages 182-185 (1925)
    This is very interesting and possibly pertinent.
    Consists of substitution test to measure ability to
    memorize quickly, mental alertness and ability to
    concentrate. In classes that used this test failures
    were well over fifty per cent, reduced to seventeen
    and one half per cent or less if required to pass
    this test.

<u>Hollingworth, H. L.</u> "Correlation of Abilities as Affected
    by Practice." "Journal of Educational Psychology"
    <u>4</u> pages 405-414 (1913) Looked it over. No value
    here to this particular investigation.

<u>Hollingworth, H. W.</u> "Vocational Psychology" (1920)
    Probably not of definite value.

<u>Hull, Clark L.</u> "Aptitude Testing." World Book Co.(1928)
    Used this extensively.

<u>Hull, Clark L.</u> "The Joint Yield from Teams of Tests."
    "Journal of Educational Psychology" Vol.14 pages 396-
    406 (1923) Survey work.

<u>Hull, C. L., and Limp, C. E.</u> "The Differentiation of the
    Aptitudes of an Individual by Means of Test Batteries."
    "Journal of Educational Psychology" <u>16</u> pages 73-88
    (1925) See thesis page 4.

<u>Jones, E. S.</u> "The Woolley Test Series Applied to the
    Detection of Ability in Telegraphy." "Journal of
    Educational Psychology." <u>8</u> pages 27-34 (1917)
    Survey work.

<u>Kelley, Truman, L.</u> "Statistical Methods" MacMillan (1924)
    Could not use. Too complicated for a layman.

<u>Kornhauser, A. W., and Kingsbury, F. A.</u> "Psychological
    Tests in Business." 3-4 (1924) This article was
    taken from "Readings" pages 146-147. Survey work.

BIBLIOGRAPHY

Freyd, M. "Selection of Typists and Stenographers."
Information on available tests. "Journal of Personal
Research." 5 pages 490-510 (1927) Reference

Griffitts, C. H. "Fundamentals of Vocational Psychology."
pages 132-138 The MacMillan Co. (1924) Looked it over.

Cronett, M. L. "A Prognostic Test in Typewriting." "Journal
of Educational Psychology" 16 pages 182-188 (1925)
This is very interesting and possibly pertinent.
Consists of substitution test to measure ability to
memorize quickly, mental alertness and ability to
concentrate. In classes that used this test failures
were well over fifty per cent, reduced to seventeen
and one half per cent or less if required to pass
this test.

Hollingworth, H. L. "Correlation of Abilities as Affected
by Practice." "Journal of Educational Psychology."
4 pages 405-414 (1913) looked it over. No value
here to this particular investigation.

Hollingworth, H. W. "Vocational Psychology" (1920)
Probably not of definite value.

Hull, Clark L. "Aptitude Testing." World Book Co.(1928)
Used this extensively.

Hull, Clark L. "The Joint Yield from Teams of Tests."
"Journal of Educational Psychology" Vol.14 pages 504-
406 (1923) Survey work.

Hull, C. L., and Limp, O. E. "The Differentiation of the
Aptitudes of an Individual by Means of Test Batteries."
"Journal of Educational Psychology" 16 pages 73-88
(1925) See thesis page 4.

Jones, E. S. "The Woolley Test Series Applied to the
Detection of Ability in Telegraphy." "Journal of
Educational Psychology." 8 pages 27-34 (1917)
Survey work.

Kelley, Truman L. "Statistical Methods" MacMillan (1924)
Could not use. Too complicated for a layman.

Kornhauser, A. W., and Kingsbury, F. A. "Psychological
Tests in business." 3-4 (1924) This article was
taken from "Readings" pages 140-147. Survey work.

BIBLIOGRAPHY

Kornhauser, A. W., and Kingsbury, F. A. "Psychological Tests
in Business." 15-20 (1924) University of Chicago Press.
Special Aptitude and Trade Tests. Survey work.

Lahy, J. M. "Les Conditiones psycho-physiologizes de l'Apti-
tude an Travail dactylographic." Journal of Psych.
Path. Gen. 15 pages 824-835 (1913) Could not get.

Link, H. C. "Employment Psychology." MacMillan Co. (1920)
This book contains considerable of value on the topic
in question. It gives several tests directly pertinent
but, unfortunately, works out no correlations so that
it is rather hard to judge of the value of the tests
which he suggests.

Limp, Charles E. "A Work in Commercial Prognosis" Journal
of Educational Research. 48-56 (June 1927) Survey work.

Limp, Charles E. "Some Scientific Approaches Toward Vocational
Guidance" "Journal of Educational Psychology" 20
pages 530-536 (1929) See thesis page 5.

Manson, G. E. "Bibliography on Psychological Tests and Other
Objective Measures in Industrial Personnel." Journal
of Personal Research. 4 pages 301-325 (1925) Very
helpful in suggesting sources of reference.

Moore, B. V. "Charts that Help Pick the Right Man for the
Right Job" Factory 25 pages 383-384 (1920) This
refers to rating scales. Survey work.

Moore & Hartman (Appleton) "Readings" Page 128 Rating scale.
Gives a very good summary of precautions for use of
rating scale. Survey work.

Morrow, Paul, R. "A Guide to Thesis Writing" Reference

Muscio, B., and Sowton, S. C. "Vocational Tests and Type-
writing." "British Journal of Psychology" 13
pages 344-369 (1923) Not in B. U. Not available.

Ohmann, O. A. "The Measurement of Capacity for Skill in
Stenography." Psychological Monographs, No. 168
pages 54-70 (1926) Could not get.

Otis, Arthur S. "The Derivation of Simpler Forms of Re-
gression Equations" "Journal of Educational Psy-
chology" Vol. 8 pages 619-622 (1917) Survey Work.

BIBLIOGRAPHY

Kornhauser, A. W., and Kingsbury, F. A. "Psychological Tests in Business." 15-20 (1924) University of Chicago Press. Special Aptitude and Trade Tests. Survey work.

Lahy, J. M. "Les conditions psycho-physiologiques de l'Apti-tude au Travail dactylographic." Journal of Psych. Path. Gen. 15 pages 824-835 (1913) Could not get.

Link, H. C. "Employment Psychology." MacMillan Co. (1920) This book contains considerable of value on the topic in question. It gives several tests directly pertinent but, unfortunately, works out no correlations so that it is rather hard to judge of the value of the tests which he suggests.

Lima, Charles E. "A Work in Commercial Proposals." Journal of Educational Research. 48-56 (June 1927) Survey work.

Lima, Charles E. "Some Scientific Approaches Toward Vocational Guidance." "Journal of Educational Psychology" 20 pages 530-536 (1929) See thesis page 5.

Manson, G. E. "Bibliography on Psychological Tests and Other Objective Measures in Industrial Personnel." Journal of Personal Research. 4 pages 301-328 (1925) Very helpful in suggesting sources of reference.

Moore, H. V. "Charts that Help Pick the Right Man for the Right Job." Factory 25 pages 383-384 (1920) This refers to rating scales. Survey work.

Moore & Hartman (Appleton) "Readings" Page 128 Rating scale. Gives a very good summary of precautions for use of rating scale. Survey work.

Morrow, Paul H. "A Guide to Thesis Writing" Reference

Muscio, B. and Sowton, S. C. "Vocational Tests and Type-writing." "British Journal of Psychology" 13 pages 344-369 (1923) Not in B. U. Not available.

Ohmann, O. A. "The Measurement of Capacity for Skill in Stenography." Psychological Monographs, No. 168 pages 54-70 (1926) Could not get.

Otis, Arthur S. "The Derivation of Simpler Forms of Re-gression Equations" "Journal of Educational Psy-chology" Vol. 8 pages 619-622 (1917) Survey work.
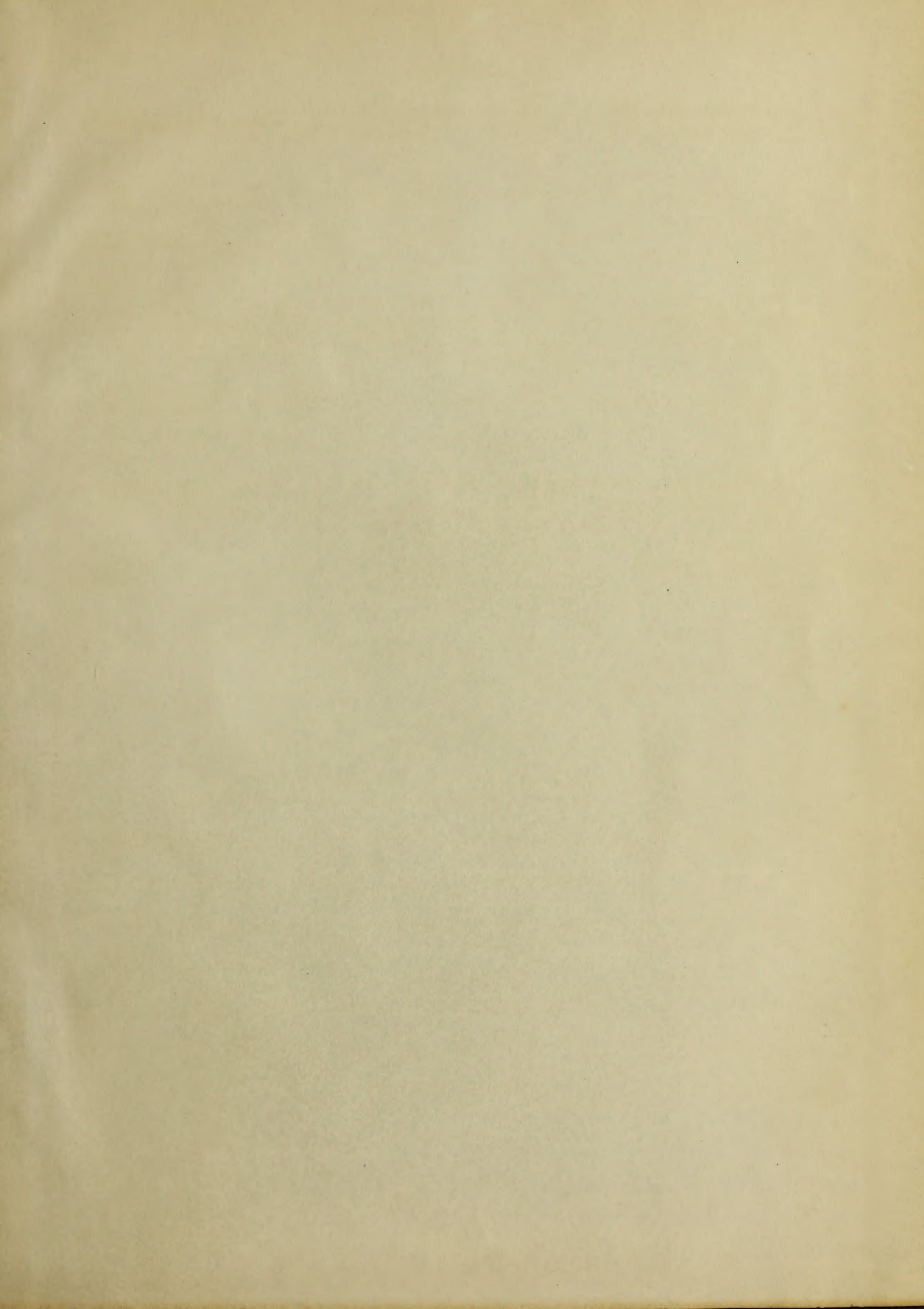
BIBLIOGRAPHY

Otis, Arthur S. "Statistical Methods in Educational Measure-
    ments" World Book Co. (1925) Consultation

Poffenberger, A. T. "The Selection of a Successful Secretary"
    "Journal of Applied Psychology" 6 pages 155-160 (1922)
    Survey work. See thesis page 3.

Reeder, Ward G. "How to Write a Thesis" Reference

Rogers, H. W. "Psychological Tests for Stenographers and
    Typewriters" Journal of Applied Psychology 1 pages 268-
    274 (1917) See thesis page 6.

Rogers, H. W. "Some Empirical Tests in Vocational Selection."
    Arch. of Psych. No. 47 page 47 (1922) Could not get.

Rugg, H. O. "Statistics for Teachers" Read parts which
    pertain to thesis.

Ruggles, A. M. "A Diagnostic Test of Aptitude for Clerical
    Office Work" New York, Teachers College, Columbia
    University Contributions to Education, No. 148
    page 85 (1924) Very complicated, of no value at
    present, but might make a good reference later for
    form of thesis, etc.

Runge, W. "Eignungsprufung und Wettbewerblustunger von
    Schreibmaschinisten" Ind. Psychol. 3 129-40 (1926)
    Could not get.

Scott, Clothier & Mathewson "Personnel Management" rev.
    ed. (1931-8,9,18) "The Biological Concept of Man."
    The Graphic Rating Scale is a very practical form.
    Survey work. Read parts pertaining to thesis.

Thorndike, E. L. "Intelligence and Its Uses." Harper's
    Magazine 140 pages 227-229 (1920) This refers to
    kinds of intelligence. Survey work.

Thurstone, L. L. "A Standardized Test for Office Clerks"
    Journal of Applied Psychology 3 pages 248-251 (1919)
    Survey work.

Thurstone, L. L. "Intelligence Tests for Engineering Students."
    "Engineering Education" 13 pages 263, 287-290, 303-
    305 (1923) Concludes that the predictive value of 6
    tests in a battery show a greater prediction for the
    success of engineering freshmen that the average work
    in the four year high school course.

BIBLIOGRAPHY

Otis, Arthur S. "Statistical Methods in Educational Measurements" World Book Co., (1925) Consultation

Poffenberger, A. T. "The Selection of a Successful Secretary" Journal of Applied Psychology 6 pages 165-180 (1922) Survey work. See thesis page 3.

Reeder, Ward G. "How to Write a Thesis" Reference

Rogers, H. W. "Psychological Tests for Stenographers and Typewriters" Journal of Applied Psychology 1 pages 268-274 (1917) See thesis page 6.

Rogers, H. W. "Some Empirical Tests in Vocational Selection." Arch. of Psych. No. 47 page 47 (1922) Could not get.

Ruga, H. O. "Statistics for Teachers" Read parts which pertain to thesis.

Ruggles, A. M. "A Diagnostic Test of Aptitude for Clerical Office Work" New York, Teachers College, Columbia University Contributions to Education, No. 148 page 85 (1924) Very complicated, of no value at present, but might make a good reference later for form of thesis, etc.

Runge, M. "Eignungsprufung und Wettbewerbsleistungen von Schreibmaschinisten" Ind. Psychol. 3 129-40 (1926) Could not get.

Scott, Clothier & Mathewson. "Personnel Management" rev. ed. (1931-8,9,16) "The Biological Concept of Man." The Graphic Rating Scale is a very practical form. Survey work. Read parts pertaining to thesis.

Thorndike, E. L. "Intelligence and Its Uses." Harper's Magazine 140 pages 227-229 (1920) This refers to kinds of intelligence. Survey work.

Thurstone, L. L. "A Standardized Test for Office Clerks" Journal of Applied Psychology 3 pages 248-251 (1919) Survey work.

Thurstone, L. L. "Intelligence Tests for Engineering Students." Engineering Education 13 pages 263, 287-290, 303-305 (1923) Concludes that the predictive value of 8 tests in a battery show a greater prediction for the success of engineering Freshmen that the average work in the four year high school course.

BIBLIOGRAPHY

Tuttle, W. W. "The Determination of Ability for Learning
        Typewriting" Journal of Educational Psychology 14
        pages 177-181 (1923) See thesis page 4.

Viteles, M. S. "Industrial Psychology" Read test section.

Viteles, M. S. "Standards of Accomplishment" Criteria of
        Vocational Selection. Journal of Personell Research.
        4 pages 483-486 (1926) Survey work.

Watts, Frank "The Construction of Tests for the Discovery
        of Vocational Fitness." Journal of Applied Psychology
        5 pages 240-247 (1921) Survey work.

West, Paul V. "The Significance of Weighted Scores."
        Journal of Educational Psychology Vol. 15 pages 302-
        308 (1924) Survey work.

Worley, Raymond J. "Prognosis in Shorthand" Journal of
        Business Education. pages 15-16 (Sept. 1931)
        Shows correlations of marks of various high school
        subjects with those of shorthand. Interesting, but
        not valuable in this investigation. Survey work.

BIBLIOGRAPHY

Tuttle, W. W. "The Determination of Ability for Learning Typewriting" Journal of Educational Psychology 14 pages 177-181 (1923) See thesis page 4.

Viteles, M. S. "Industrial Psychology" Read test section.

Viteles, M. S. "Standards of Accomplishment" Criteria of Vocational Selection. Journal of Personnel Research. 4 pages 483-486 (1926) Survey work.

Watts, Frank "The Construction of Tests for the Discovery of Vocational Fitness." Journal of Applied Psychology 5 pages 240-247 (1921) Survey work.

West, Paul V. "The Significance of Weighted Scores." Journal of Educational Psychology Vol. 15 pages 302-308 (1924) Survey work.

Worley, Raymond J. "Prognosis in Shorthand" Journal of Business Education. pages 15-16 (Sept. 1931) Shows correlations of marks of various high-school subjects with those of shorthand. Interesting, but not valuabl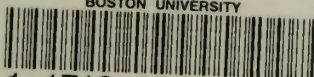e in this investigation. Survey work.